

Config > Alarming > Alarm Notification Profiles

Main	
Language	English (General) (default: en)

Call Script	
Greeting	Hello, this is an Ignition alarm notification.
PIN Challenge	Please enter your pin, followed by the pound sign. A message asking the user to enter their PIN number. Must instruct them to press '#' when finished.
Non-PIN Challenge	Please press any key to continue. When a PIN is not required, this message is played to instruct the users to press any key to continue.
Invalid PIN	Invalid pin number.
Summary	There are %d events. When there are multiple alarms, this message will be played to tell the user how many to expect. It must include the placeholder '%d' somewhere in the message.
Active Message	At [eventTime hh:mm:ss], alarm named {name} became {eventState} with a value of {eventValue} The message to play for active alarms. This message can reference properties of alarms by using syntax like "{propertyName}".
Clear Message	At [eventTime hh:mm:ss], alarm named {name} became {eventState} with a value of {eventValue} The message to play for cleared alarms. This message can reference properties of alarms by using syntax like "{propertyName}".
Option 1: Acknowledge	Press 1 to acknowledge Tells the user to press '1' to acknowledge.
Acknowledge Confirmation	Alarm has been acknowledged. Tells the user that the alarm event has been successfully acknowledged.
Option 2: Ignore	Press 2 to ignore Tells the user to press '2' to ignore/bypass the alarm.
Ignore Confirmation	Alarm has been ignored.
Option 3: Repeat	Press 3 to repeat Tells the user to press '3' to repeat the last message.
Closing	Thank you, goodbye.

**Save Changes**

4. Here is an example of some of the default scripts in Spanish. Once again, you can edit the scripts to your requirements. When editing is complete, click **Save Changes**.

You can attach a different script for any language that Ignition supports depending on the user, and whatever that user is setup to do. So, if the script is in Spanish, the user will receive the voice notification in Spanish assuming the Spanish voice module is installed in Ignition.

- Once you have the appropriate voice module and language module(s) installed, go to **Security > Users, Roles**. Select the **manage users** link for the default user source.

- You can edit every single user, and put each user into a different language, as long as the language that you select for each user has the voice module for the language installed. In this example, let's edit a user named Sal. Put Sal into the Spanish language. If the voice module is installed for the Spanish language, Ignition will automatically choose the Spanish script.

Config > Security > User Sources

Users Roles

User Properties

Username	bamanakan bamanakan (Mali) bosanski bosanski (latinica) bosanski (latinica, Bosna i Hercegovina) brezhoneg brezhoneg (Frañs) català català (Andorra) català (Espanya) català (Espanya, valenciac) català (França) català (Itàlia) chiShona chiShona (Zimbabwe) dansk
Change Password?	
Password	
First Name	dansk (Danmark) dansk (Grønland) davvisámegiella davvisámegiella (Norga) davvisámegiella (Ruotta) dolnoserbščina dolnoserbščina (Nimska)
Last Name	duálá duálá (Cameroun) eesti eesti (Eesti)
Roles	
Schedule	
Language	español español

The 'Language' dropdown menu is open, showing a list of language names and their corresponding country codes. The item 'español' is highlighted with a red box.

Now when the alarm notification is received, the voice message will be in Spanish. You can also change a user's language preferences from the [User Management](#) component.

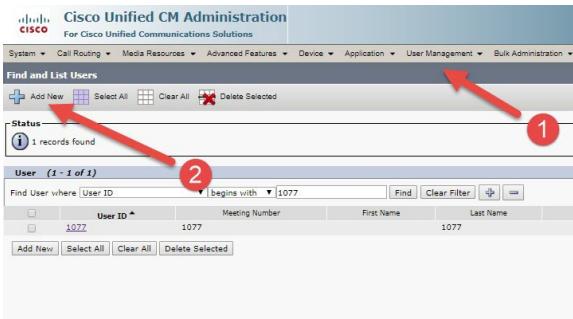
# Registering Voice Alarm Module to CUCM

Cisco Unified Communications Manager (CUCM) is a communication system, that can work in tandem with Ignition's Voice Notification module. This page demonstrates how to register the Voice Notification module with CUCM.

## Registering Guide to CUCM

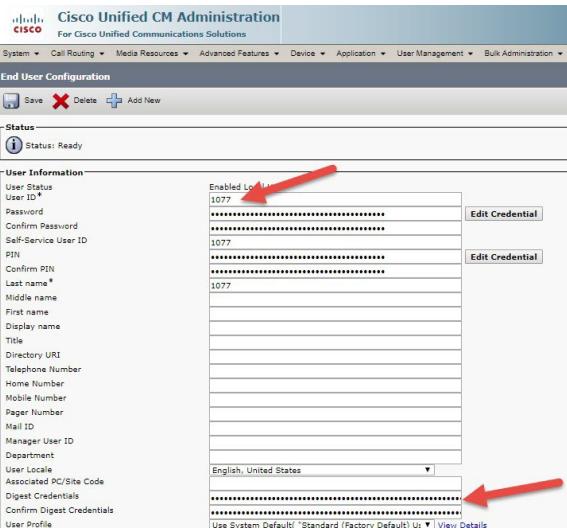
To register Ignition, you will need to create a third-party Session Initiation Protocol (SIP) device. Do not register Ignition via SIP trunk. Also note if you have created an SIP trunk already to your Ignition server, you will have a conflict with your third-party SIP device not registering to Ignition.

1. In CUCM, Under User Management, select End User then click Add New.

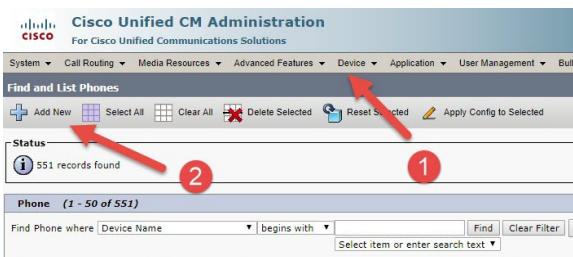


2. Create a user with digest credentials.

**Note:** Use the extension as the username. Ignition will not register to third-party SIP if you are using regular characters.



3. Under Device, select Phone then click Add New.



## On this page ...

- Registering Guide to CUCM
- CUCM and Redundancy Considerations

4. Select **Third-party SIP Device (Basic)** as your phone type.

Cisco Unified CM Administration  
For Cisco Unified Communications Solutions

Add a New Phone

Status  
Status: Ready

Create a phone using the phone type or a phone template:  
 Phone Type\* **Third-party SIP Device (Basic)**  
 or  
 BAT Phone Template\* -- Not Selected --

Next

\* indicates required item.  
\*\* Create a phone template using the Bulk Administration Tool to enable template-based phone creation.

5. For phone configuration, configure everything as usual. For the digest user, use the end user you created at the start.

**Note:** You do not need an actual Mac address, you can use 000000000000). Also you do not need an owner user ID. You would only need a digest user to register Ignition to CUCM.

Cisco Unified CM Administration  
For Cisco Unified Communications Solutions

Phone Configuration

Save

Remote Number:  
Calling Party Transformation CSS: < None >  
 Use Device Pool Calling Party Transformation CSS (Device Mobility Related Information)

Protocol Specific Information:  
 BLF Presence Group\*: Standard Presence group  
 RTP Preferred Originating Codec\*: 711ulaw  
 Device Security Profile\*: -- Not Selected --  
 Rerouting Calling Search Space: < None >  
 SUBSCRIBE Calling Search Space: < None >  
 SIP Profile\*: < None > [View Details](#)  
 Digest User: < None > **Find**

MLPP and Confidential Access Level Information:  
 MLPP Domain: < None >  
 Confidential Access Mode: < None >  
 Confidential Access Level: < None >

Save

6. For line configuration, configure how you would usually configure a line.

**Note:** You do not need a user associated to the line.

## CUCM and Redundancy Considerations

CUCM is not able to handle two concurrent connections to the same phone type device using the same username/password combinations. Due to this limitation, redundant Ignition Gateways will fail to send voice notifications if both Master and Backup servers are simultaneously trying to connect to the same CUCM phone device. To get around this problem, create two users and two phone devices CUCM side. On your Ignition Master Gateway, create two Voice Notification Profiles. One Notification Profile will be bound to the Master's IP address and be configured to point to one CUCM phone device using one set of user credentials. The second Notification Profile will be bound to the Backup's IP address and be configured to point to the second CUCM phone device using the second set of user credentials. This will provide a Voice Notification Profile that will only work on your Master Gateway and another that will only work on your Backup Gateway. Your Alarm Pipelines must then include additional logic to switch between Voice Notification Profiles, or Notification Blocks, depending on which redundant node is active.

### Related Topics ...

- [Voice Notification Scripts](#)



# Remote Gateway Notification

The Remote Alarm Provider offers several ways to utilize the alarm notification capabilities of a remote Ignition Gateway. Alarms can be sent through a central Gateway, with full support for remote acknowledgement delivery. This means that you can manage your Email, SMS, and Voice equipment in a central location, and provide those services to a multitude of Gateways.

After configuring a remote provider, the Ignition Gateway will automatically expose the alarm pipelines configured on the remote system. Tags can then target those pipelines directly, with no further configuration required. Alternatively, custom pipelines can be created, and can utilize the remote notification profile through the Notification block, thus expanding the already significant power of alarm pipelines to include the notification capabilities of other Gateways.

The Remote Alarm Provider is provided by the Alarm Notification Module, which must be present on all Gateways involved. However, notification modules, such as SMS and Voice, only need to be present on the Gateways that are ultimately executing the notification.

 **Remote Gateway must be on same Gateway network**

In order to use the alarm notification capabilities of a remote Ignition Gateway, your Gateway and the Gateway you want to connect to must be connected to the same Gateway network.

Enabling remote alarm notifications is easy. There are just a few steps to follow to establish your connection to the designated Gateway, expose the pipelines that are part of that Gateway, and to configure your Tag(s), thus, enabling the alarm notification. .

## On this page ...

- [Connect to a Remote Gateway and Select a Profile](#)
- [Enable the Remote Alarm Notification](#)



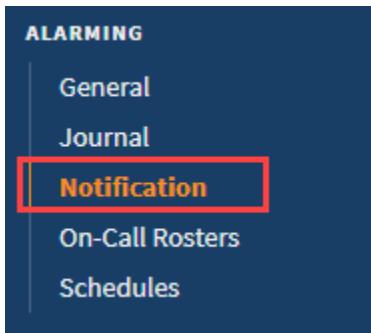
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## Remote Alarms

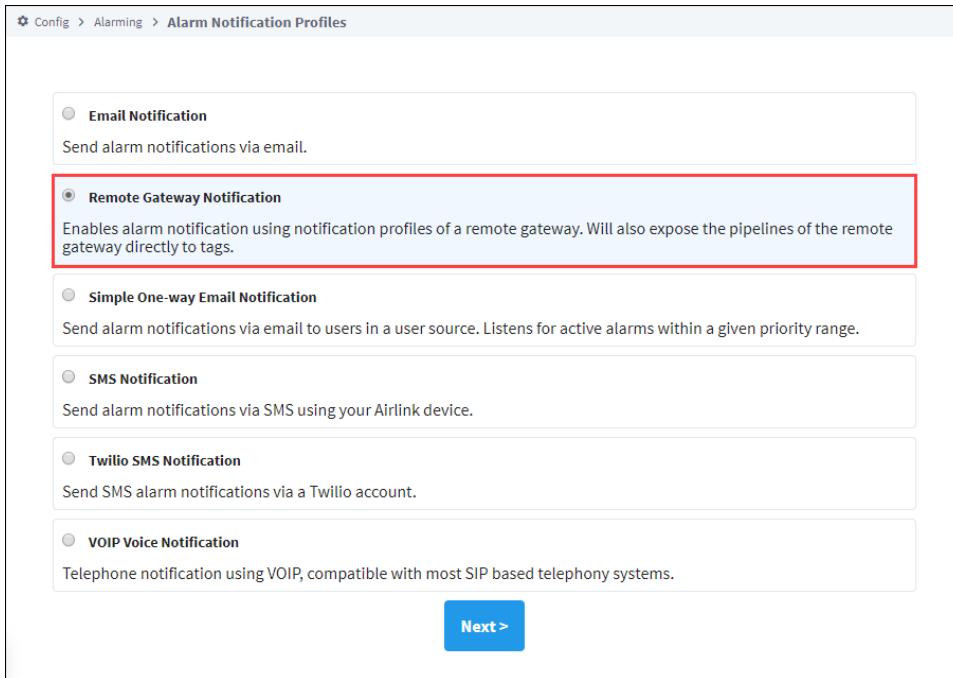
[Watch the Video](#)

## Connect to a Remote Gateway and Select a Profile

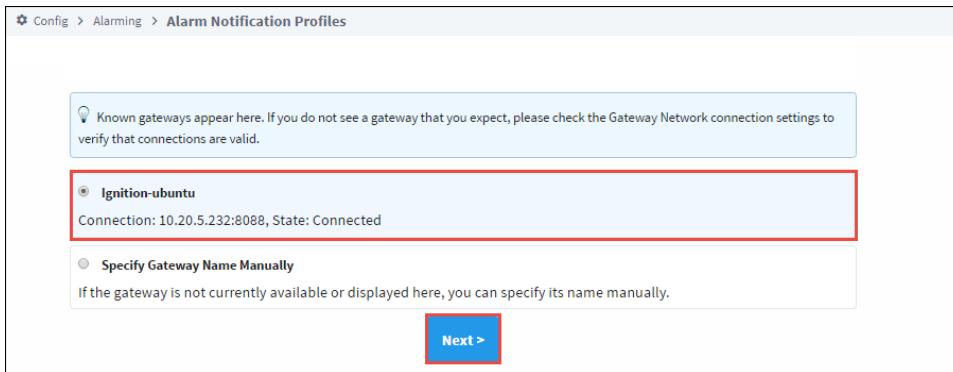
1. Go to the **Config** section of the Gateway Webpage.
2. Scroll down and select **Alarming > Notification**.



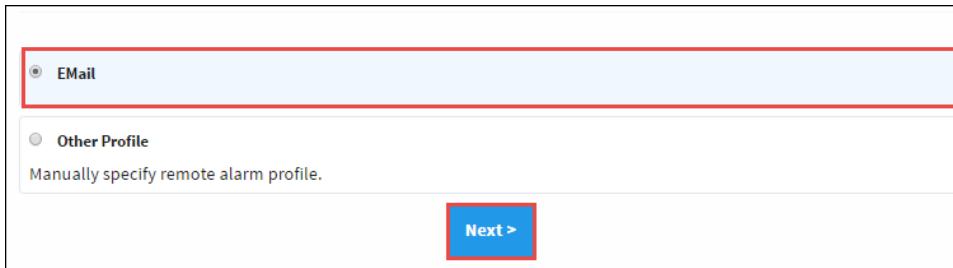
3. Click **Create new Alarm Notification Profile**.
4. Select **Remote Gateway Notification**, and click **Next**.



5. All the known Gateways will be displayed. Choose from the list of available Gateways or you can setup a Gateway manually, then click **Next**.



6. Once your Gateway is connected, Ignition exposes all the pipelines on that Gateway. Choose from the list of available Remote Notification Profiles, and click **Next**.



7. The new Remote Notification Profile window will appear. It will automatically show the name of your Gateway followed by the name of the remote Profile unless you are manually specifying a remote profile. There is a naming convention that is used when identifying the 'Name' of the New Remote Notification Profile. It is the Gateway Name followed by an underscore and the name of the Profile (i.e., Ignition-ubuntu\_Email). Click **Create New Alarm Notification Profile**.

Config > Alarming > Alarm Notification Profiles

<b>Main</b>	
Name	Ignition-ubuntu_EMail <input style="width: 20px; height: 20px;" type="button" value="..."/>
Description	<input type="text"/>
Enabled	<input checked="" type="checkbox"/> (default: true)
<b>Remote Gateway</b>	
Gateway	Ignition-ubuntu
Notification Profile	Email
<input type="checkbox"/> Show advanced properties	
<input style="background-color: red; color: white; padding: 5px; border: none;" type="button" value="Create New Alarm Notification Profile"/>	

8. The Alarm Notification Profiles window will open showing all your alarm profiles including the one you just created.

Config > Alarming > Alarm Notification Profiles

Name	Description	Enabled	Type	Status	delete	edit
Email Notifications		true	Email Notification	Running	<input type="button" value="delete"/>	<input type="button" value="edit"/>
Ignition-ubuntu_EMail		true	Remote Gateway Notification	Running	<input type="button" value="delete"/>	<input type="button" value="edit"/>
Test		true	Email Notification	Running	<input type="button" value="delete"/>	<input type="button" value="edit"/>
Voice		true	VOIP Voice Notification	Registered with VOIP Host	<input type="button" value="More"/>	<input type="button" value="edit"/>

[→ Create new Alarm Notification Profile...](#)  
[→ Test Pipelines and Notification Profiles...](#)

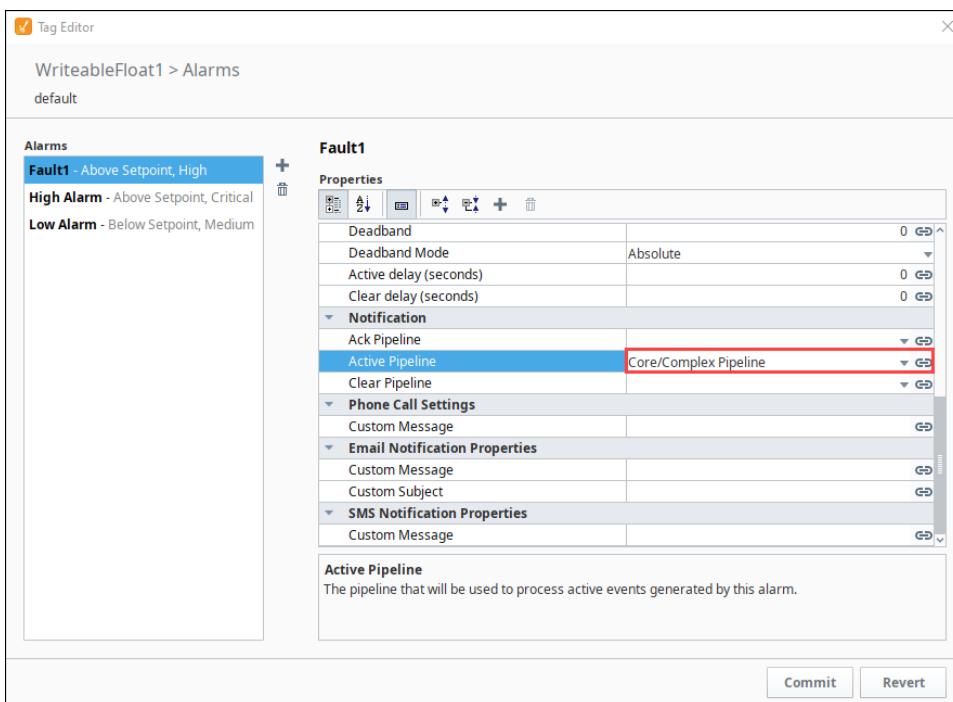
## Enable the Remote Alarm Notification

The last steps are to select your Tag, add an alarm, and configure your alarm settings. If you already have an existing alarm, then all you need to do is go to your alarm configuration, and select the remote pipeline that you want to use for your alarm.

- In the Designer, under the Tag Browser, double click on your Tag (i.e., WriteableFloat1) to open the Tag Editor.

Tag Browser			
▶ Random			
▶ ReadOnly			
▶ Realistic			
▶ Sine			
▼ Writeable			
▶ WriteableBoolean1 OPC	<input type="checkbox"/>	Boolean	
▶ WriteableBoolean2 OPC	<input type="checkbox"/>	Boolean	
▶ WriteableDouble1 OPC	0	Double	
▶ WriteableDouble2 OPC	0	Double	
▶ WriteableFloat1 OPC	0	Float	🔔
▶ WriteableFloat2 OPC	0	Float	
▶ WriteableInteger1 OPC	0	Integer	
▶ WriteableInteger2 OPC	0	Integer	

2. In the Tag Editor, scroll down to Alarms and click the **Edit** icon.
3. Select your **alarm** (i.e., Fault1). (If you don't have an alarm, then you'll need to add an alarm. (Refer to the section on [Configuring Alarms](#).)
4. Scroll down to the **Notification** area and under **Active Pipeline**, select the remote pipeline (i.e., Core/Complex Pipeline) that you want to use from the dropdown list.
5. Click **Commit**.



Now, you can even create new custom pipelines and use the remote notification profile through the Notification block, while expanding the significant power of alarm pipelines to include the notification capabilities of other Gateways sharing the same Gateway network.



#### Notification Modules need to be installed on the Gateway running the notification

The appropriate Notification Modules such as SMS and/or Voice must be installed on the Gateways that are executing the alarm notification.



Once your Notification profile is created, you can use it in an [Alarm Pipeline](#).

Related Topics ...

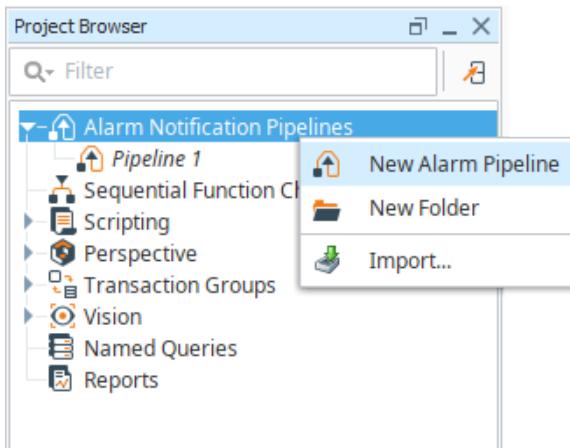
- [Alarm Notification Pipelines](#)

# Alarm Notification Pipelines

Alarm Notification Pipelines are logic diagrams that control how alarm notifications are sent out, including who they are sent to and when. They can be used to achieve many advanced alarming scenarios, such as delays, escalation, and parallel delivery. Pipelines provide an easy to use a drag and drop mechanism for creating complex notification scenarios.

## Creating Pipelines

Before you create a pipeline in the Designer, you need to configure at least one [alarm notification profile](#) and at least one [roster](#) in the Gateway. Then in the Designer, you create the Pipelines under the **Global** node of the **Project Browser**. Alarm Pipelines, unlike other types of resources such as windows and Transaction Groups, are global resources, and are not part of a project. A defined pipeline runs in the Gateway, and you can see the same pipelines available to edit regardless of the project that is currently open. If you already have a Remote Gateway configured to support alarm notifications, you can expand the already significant power of alarm pipelines by also exposing alarm pipelines that are configured on the [Remote Ignition Gateway](#) system.



## On this page ...

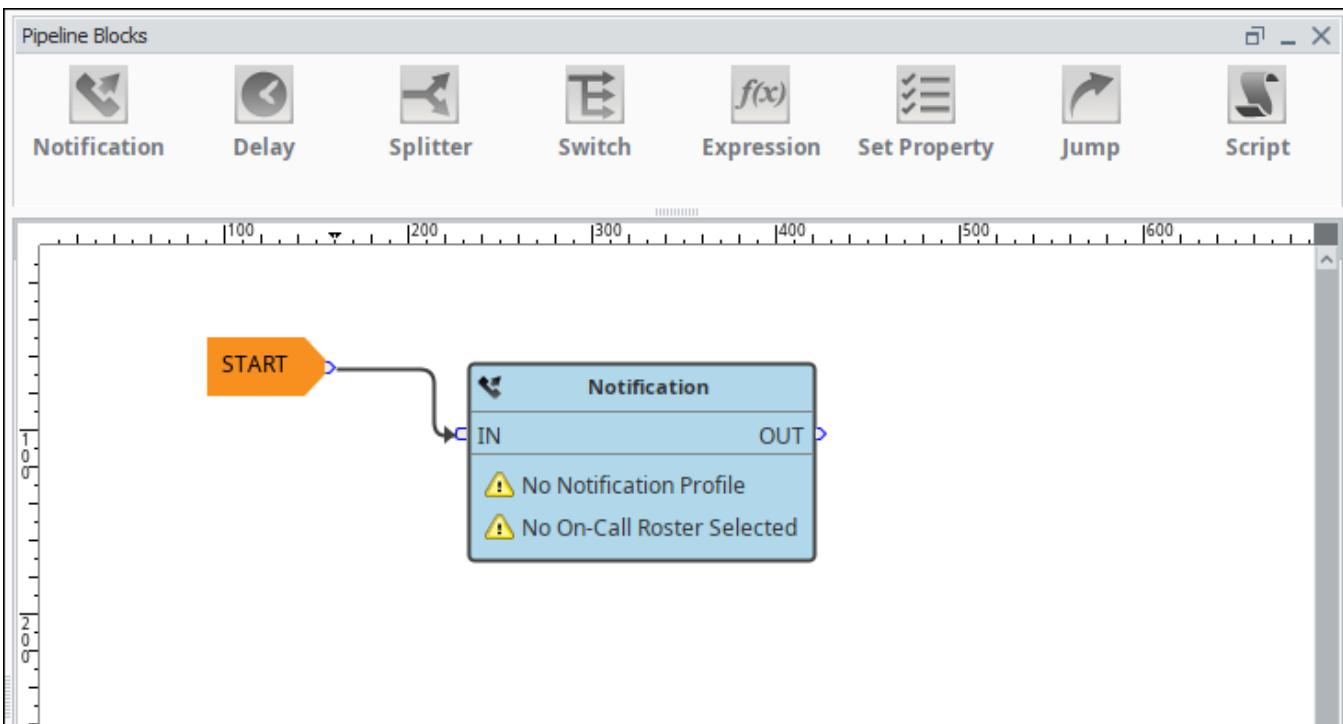
- [Creating Pipelines](#)
- [Understanding Pipelines and Events](#)
  - [Event Instances and Runtime Properties](#)
  - [Pipeline Lifecycle](#)
- [Pipeline Blocks](#)
- [Pipeline Properties](#)
  - [To Display and Modify the Properties](#)
  - [Commonly Used Properties](#)



## Alarm Pipeline Overview

[Watch the Video](#)

When you create a new pipeline, or select one to edit, the Designer Switches to the Pipeline Workspace. The workspace is a blank canvas on which you arrange and connect together various [Pipeline Blocks](#). Each pipeline block has an input, and potentially has outputs. Using the mouse, you can draw connectors between the output of one block into the input of another. The START block, which you will see when you first create the pipeline, cannot be deleted and is the only fixed part of the workspace. It represents the entry point for alarm events into the pipeline, and is treated like an output block.



Multiple outputs can be connected to a single input. Also, it is perfectly acceptable to write the output of a downstream block back to the input of an earlier block, creating a loop. Of course, some care should be taken when doing this, as it can easily result in unexpected behavior, like sending out emails indefinitely for one event!

## Understanding Pipelines and Events

Understanding how events flow through pipelines is crucial to leveraging them fully. Alarms are configured on individual Tags, and each alarm can specify a target pipeline for active and clear conditions. When the condition for that alarm is met a new alarm event is generated and sent to the entry point of the associated pipeline. The alarm event then moves through the different logical elements of the pipeline until it finally reaches a pipeline endpoint, or until the alarm matches the pipeline's dropout condition, upon which it then exits the pipeline. There can be multiple alarm events in a pipeline at any given point in time and you can view the current status of the pipeline from the Alarm Pipelines status screen in the Ignition Gateway. It is possible to forward events from one pipeline to another, making it possible to create multipurpose and reusable pipelines.

Each alarm event progresses sequentially through the blocks of a pipeline. However, multiple alarm events can exist in parallel in the pipeline, and new events may enter the pipeline at any time. Some block settings may result in alarm events being held up, such as consolidated notification, but one alarm event cannot affect other events in the pipeline. In this particular case, when multiple events will be collected together for notification, the events that don't drop out of the pipeline after notification are individually forwarded to the output of the block.

At every transition, and occasionally inside of the block execution as well, the dropout conditions will be evaluated. If the event no longer meets the conditions, it will drop out of the pipeline. It is crucial to understand how this works in order to understand pipeline execution. For example, a common scenario is to place a Delay block directly in front of a Notification block. If the delay is 5 minutes, and "Clear" is one of the pipeline drop out conditions, it effectively means that only events that stay active for longer than 5 minutes will actually result in notifications. If acknowledge is one of the dropout conditions, it would mean that operators (or anyone viewing alarm status) would have 5 minutes to acknowledge them, and only then would notifications be sent.

## Event Instances and Runtime Properties

As mentioned, a new "alarm event" is generated each time an alarm transitions to active. This event consists of core data, but also has arbitrary properties available on it. The alarm configuration properties are available, as well as associated data, but in addition there are "runtime properties", that only exist while the alarm event is in memory, and are only used by pipelines. These properties can be accessed by several block types, and runtime properties can be created and updated with the "Set Property" block type.

During an alarm event's lifetime, its properties may be updated at any time. When an alarm goes to clear, for example, the system sets information about that state on the alarm event. In the pipeline, if a block accessed the "state" property, it would see a different value than if it had checked just moments earlier.

It may be possible for a specific alarm event to exist multiple times in a pipeline. This is especially true when using the Splitter block, which takes events and forwards them concurrently to multiple outputs. When this occurs, the alarm event is "branched" and a new "event instance" is created. Each event instance will start with identical properties, but future modifications of properties will only affect the particular instance. All instances of an event will properly reflect properties set later by the system, such as acknowledgement or clear state.

## Pipeline Lifecycle

Given the potentially long running nature of pipelines, it's important to understand how they operate when you edit them. Each pipeline normally has only one instance running at a time, which handles all of the events that go into it. When you edit a pipeline and save, however, a new instance is instantiated. The old instance is "retired", but continues to run until all of the existing events are done. The new instance only receives events generated after the time that it was created, it does not take over the previous instance's events.

## Pipeline Blocks

Pipeline Blocks are the building blocks of the Alarm Pipelines. Each block, depending on the type, will perform some action for the pipeline, such as sending a notification, setting a property, or evaluating an Expression. Refer to the [Pipeline Blocks](#) section for descriptions of the different pipeline blocks that you can use to build your pipeline.

## Pipeline Properties

Pipelines have only a few property settings, but they are important.

### To Display and Modify the Properties

Click on the gray area of the Pipeline workspace anywhere there isn't a block.

In the lower-left corner of the Designer, the Pipeline Properties are displayed. They are as follows:

- **Dropout Conditions**

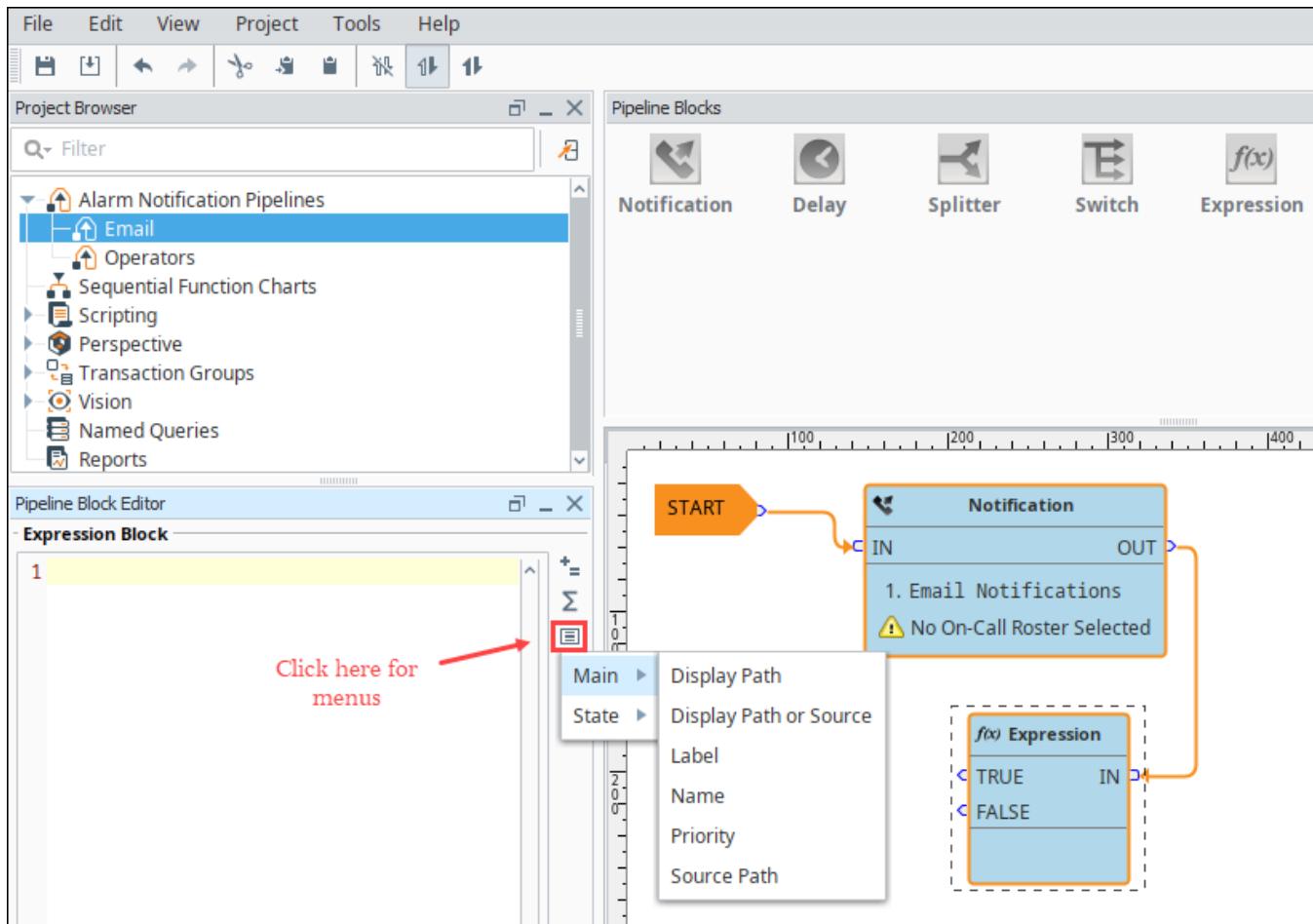
These dictate when alarms fall out of the pipeline. There are three possible conditions: **Acknowledged**, **Cleared**, and **Shelved**. If any of the selected conditions become true for an event in a pipeline, it will "drop out" entirely, no matter where it is at. No further action will be taken for that event.

- **Pipeline Enabled**

Indicates whether or not the pipeline is allowed to receive events.

### Commonly Used Properties

The following screenshot shows how you can access the two commonly used sets of properties in the Expression Block: the **Main** and **State** properties.



The **Main** properties are information about the alarm that are independent of whether the alarm is currently active, clear or acknowledged. They are:

- Display Path
- Display Path or Source
- Name
- Priority
- Source Path

The **State** properties are information about the alarm that change while the alarm is changing, and some of them even change each time the alarm goes from active to clear to ack (acknowledged).

- Ack Time
- Ack'd By
- Ack'd By (Name)
- Acked?
- Active Time
- Active?
- Clear Time
- Clear?
- Current State
- Event State
- Event Time
- Event Value
- Is Shelved?

Alarms events are made up of many different properties. Refer to the [Alarm Event Properties Reference](#) section for information on alarm properties and how they are used.

[In This Section ...](#)

# Alarm Pipeline Designer Interface

The Alarm Pipeline Designer Interface is where you create your own custom pipelines to control the flow of an alarm to its notification. It provides all the functionality to create tasks that customize how alarms going through the pipeline notify people of the alarm.

The Pipeline Designer Interface is an easy to use graphical mechanism, and uses the drag and drop method for building complex alarm notification scenarios. Like other Ignition module interfaces, the Pipeline Designer Interface is organized into panels, some of which are specific to the Pipeline Designer Interface such as the **Pipeline Blocks** and the **Pipeline Block Editor**, and some you have seen before, such as the Project Browser and Tag Browser.

On the Alarm Notification Pipeline Welcome tab, you'll notice that there are some basic template pipelines to help get you started creating your own alarm notification pipelines. You can choose from the Priority and Escalation pipelines, or have the option to start from the Blank pipeline. These pipelines provide a basic skeleton for you to get started creating a priority or escalation pipeline which are common pipelines for alarm notifications. Once you have your several pipelines created, it will also show you the most recently modified pipelines along with the date it was last modified and who modified it. You can double click on a recently modified pipeline to easily open and update it.

The Alarm Notification Pipeline Welcome tab provides a quick way to create a new custom pipeline and update existing ones.

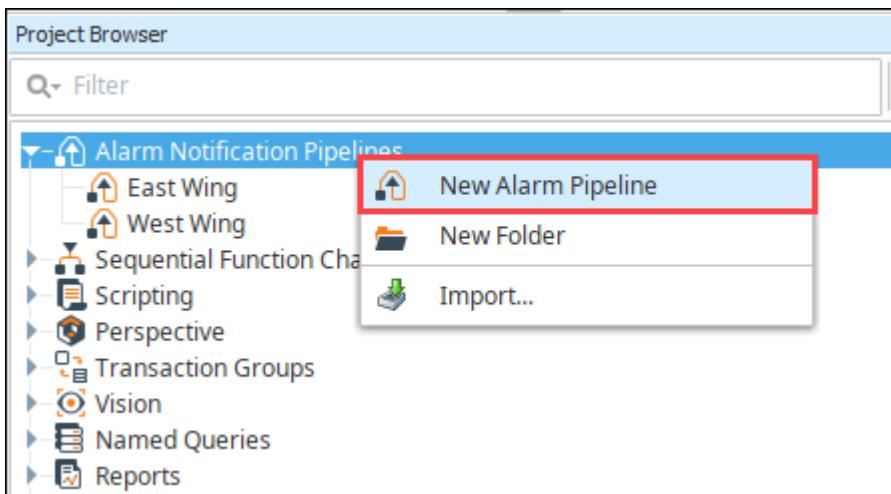
## On this page ...

- [Project Browser](#)
- [Pipeline Blocks](#)
- [Pipeline Block Editor](#)
- [Alarm Pipeline Design Area](#)

The screenshot shows the Ignition Alarm Pipeline Designer interface. The top navigation bar includes File, Edit, View, Project, Tools, and Help. Below the navigation is a toolbar with various icons for file operations like Open, Save, and Print. To the left is the Project Browser panel, which lists categories like Alarm Notification Pipelines, Sequential Function Charts, Scripting, and others. The Pipeline Blocks palette is located at the top right, displaying icons for Notification, Delay, Splitter, Switch, Expression, Set Property, Jump, and Script. The main workspace is divided into two sections: 'Alarm Notification Pipelines' and 'Recently Modified Pipelines'. The 'Alarm Notification Pipelines' section features a 'Create a New Pipeline' button with a text input field for 'Name of the pipeline'. It also shows three pipeline templates: 'Blank Pipeline' (selected), 'Priority Pipeline', and 'Escalation Pipeline'. A 'Create' button is located below these. The 'Recently Modified Pipelines' section displays a table with one row: 'Blank' (Last Modified: Sep 3, 2020, 4:22:17 PM) by 'admin'. At the bottom left is a 'Select a Block' button, and at the bottom center is a 'Pipeline Block Editor' button.

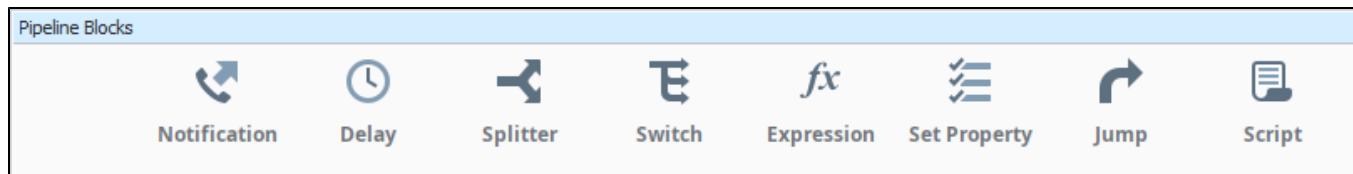
## Project Browser

You'll find alarm pipelines in the **Project Browser** panel which appears in the top left corner of the Designer. Here you can create new alarm pipelines, organize your pipelines into folders, and import pipelines from other projects. Like other resources, [pipelines are inheritable](#), so a pipeline can be configured in one project, and inherited by another.



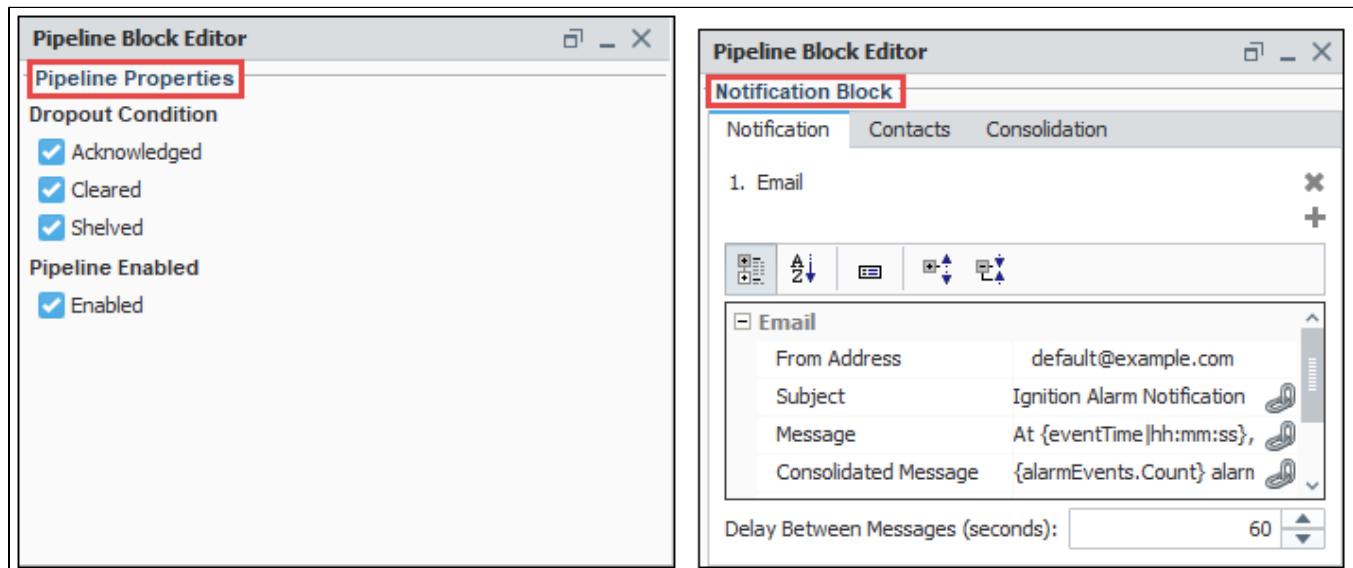
## Pipeline Blocks

**Pipeline Blocks** are the building blocks of the Alarm Pipelines and are located at the top of the Designer. Each pipeline block has unique functionality that performs tasks such as sending notifications, alarm escalation, setting a delay, evaluating an expression, and more. Simply drag any of the pipeline blocks to your design area and configure each pipeline block's properties.



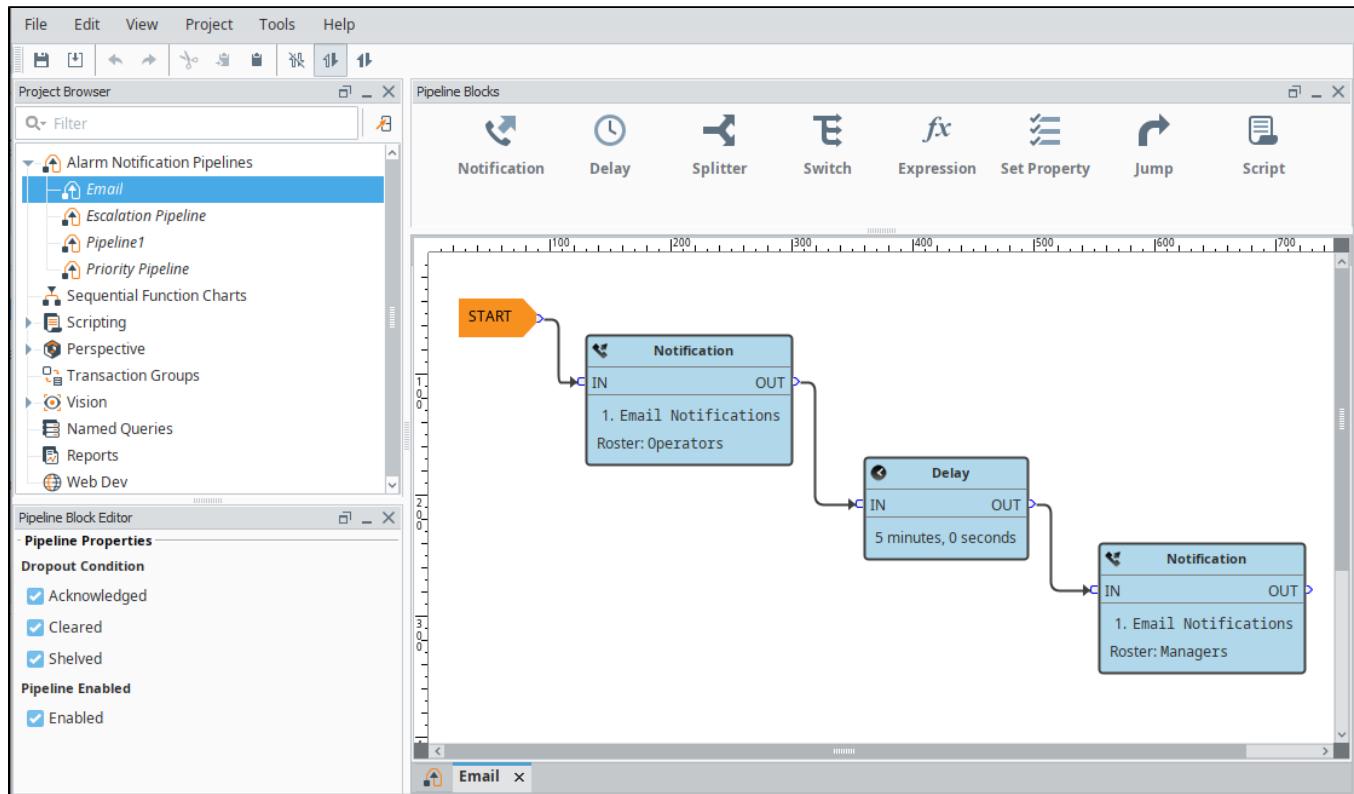
## Pipeline Block Editor

The Pipeline Block Editor displays the pipeline properties and properties of the selected pipeline block. To see pipeline properties, click anywhere in the workspace. Since each pipeline block performs a specific function, it also has its own properties. Select the pipeline block to see its properties. The image below shows both the Pipeline's properties and a Notification block's properties.



## Alarm Pipeline Design Area

In this example, we used the Blank pipeline to create an Email pipeline. The Blank pipeline opens with the Start step, now drag the appropriate pipeline blocks to your canvas and begin building the logic for your notification pipeline. Set the properties for each pipeline block and connect the blocks to create your pipeline. The image below shows a simple pipeline that when an alarm occurs, a notification will be sent to Operators via email. If an operator doesn't respond to the notification within 5 minutes, a second email will be sent to another on-call roster called Managers.



# Simple Pipeline

The most basic Alarm Notification Pipeline will simply notify users as soon as the [alarm](#) becomes active.

## Configure Alarm Notification Profile and On-Call Roster

Before you create a pipeline in the Designer, you need to configure at least one [Alarm Notification Profile](#) and at least one [On-Call Roster](#) in the Gateway.



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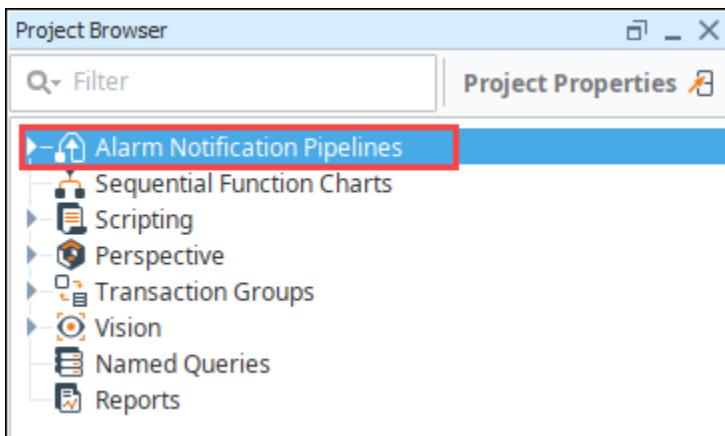
## Simple Pipeline

[Watch the Video](#)

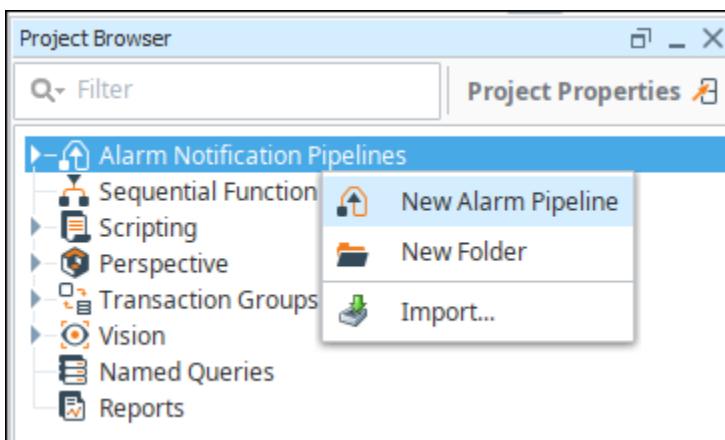
## Create an Alarm Notification Pipeline

The following example will create a simple alarm notification pipeline in Ignition.

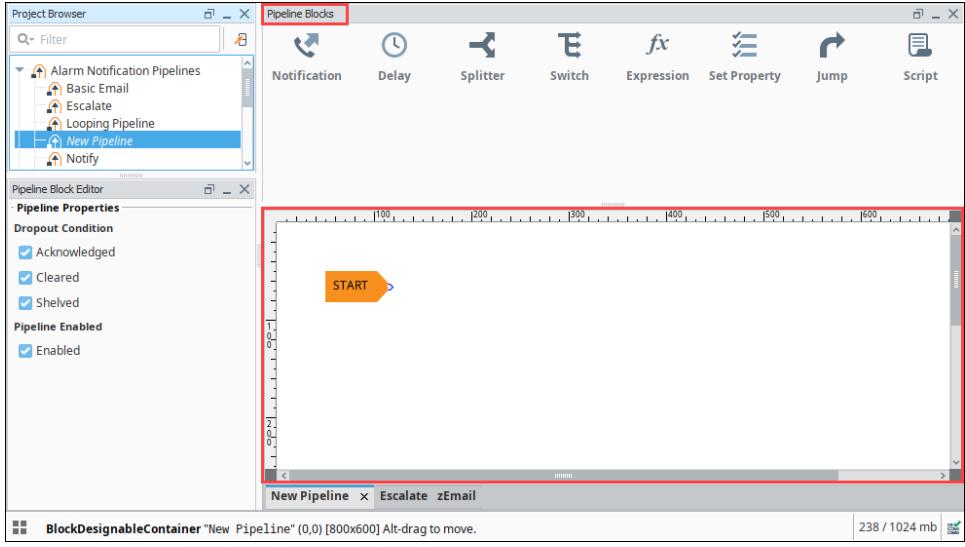
1. In the **Designer**, create a new pipeline in the **Project Browser** by going to the **Global** area.



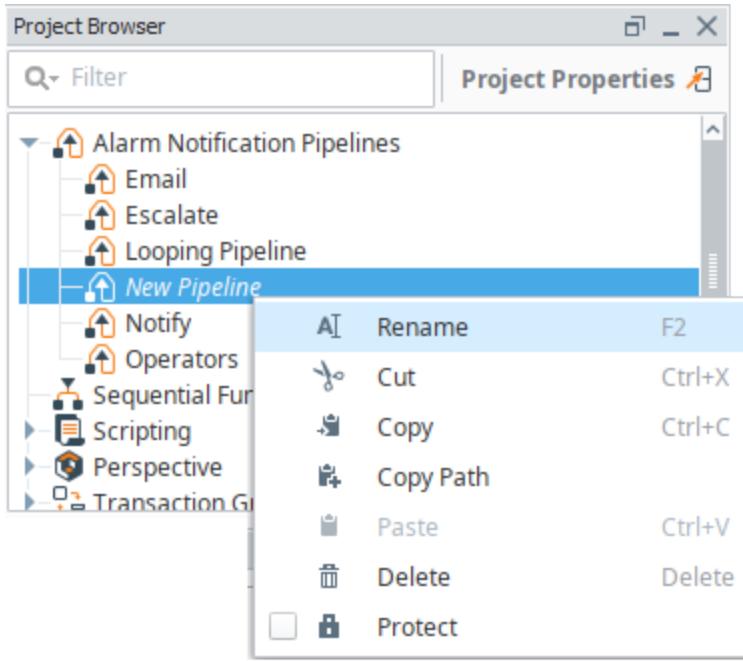
2. Select **Alarm Notification Pipelines**, and right click to create a **New Alarm Pipeline**.



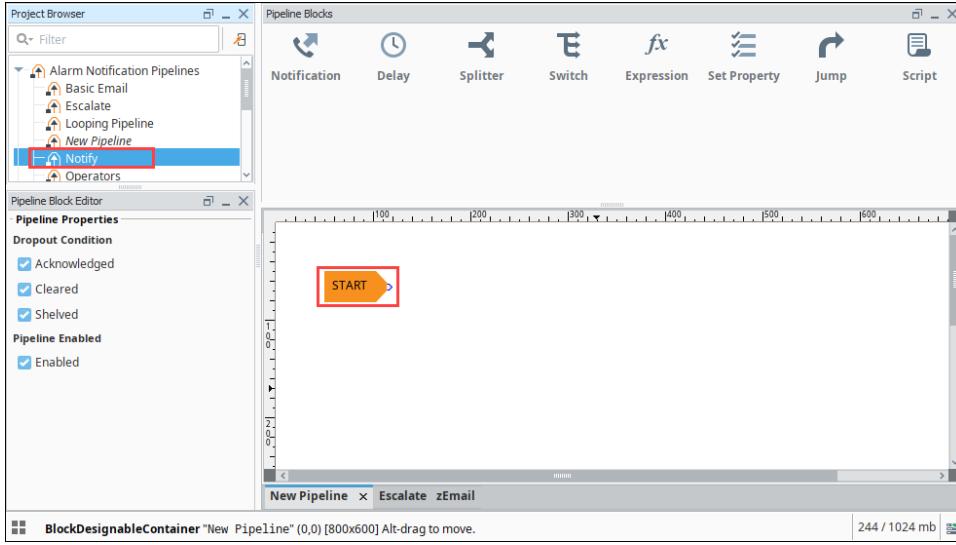
When you create a new pipeline, the Designer switches to the Pipeline workspace. The workspace is essentially a blank canvas and can contain various [Pipeline Blocks](#). By default, the name of the new pipeline is called '**New Pipeline**'.



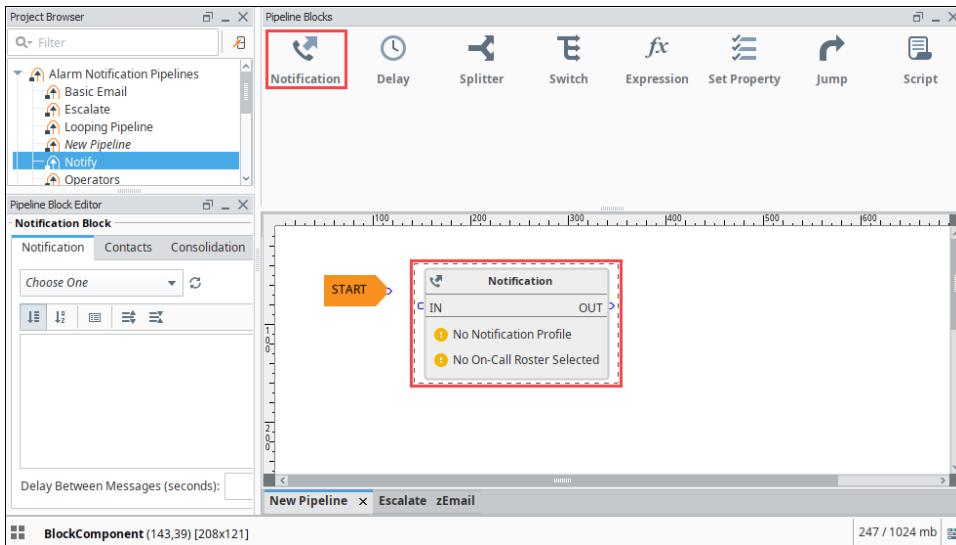
3. It is a good practice to give a meaningful name to the pipeline. Commonly, the name acts as a way to describe what the pipeline does. Select the New Pipeline, right click and rename it "Notify".



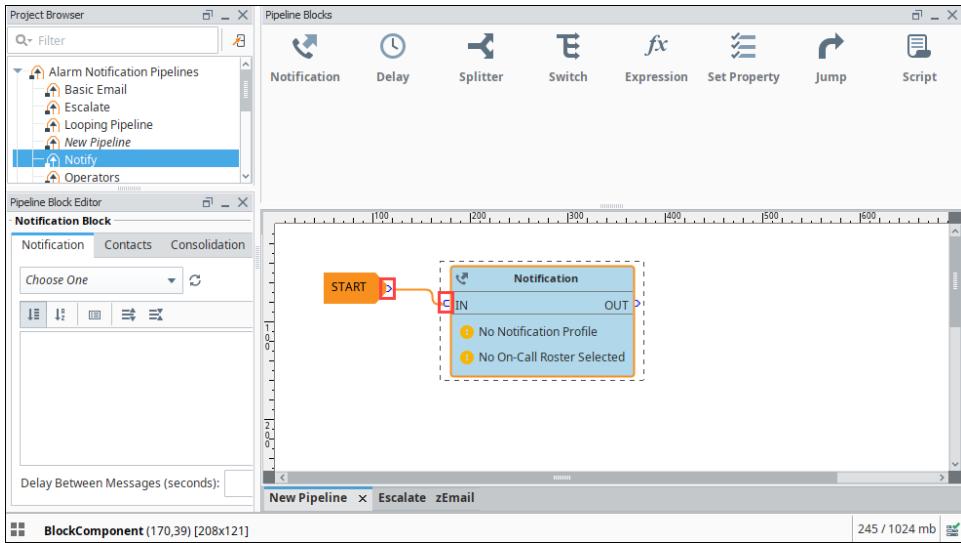
Every pipeline has a Start block which you will see when you create your pipeline. When an alarm is triggered, it automatically goes to the Start block, and from there you can use other pipeline blocks to determine what you want to do with that alarm. All the available pipeline blocks are shown at the top of the Pipeline Workspace.



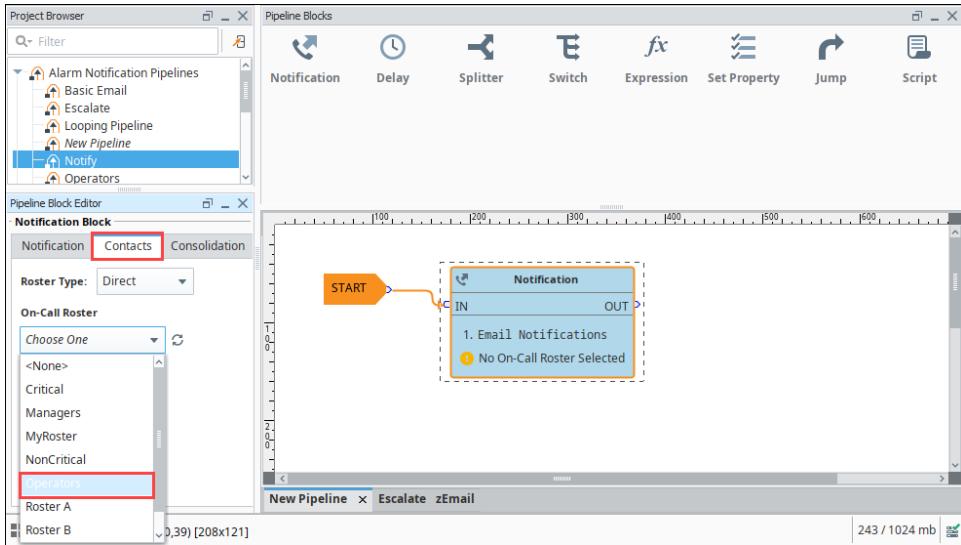
4. The most basic pipeline you can create is to simply notify someone right away when an alarm occurs. Drag the Notification block on to your canvas and place it next to the Start block. Once you drag it in to your pipeline, it is not connected.



5. Drag the output pin from the Start block to the input pin of the Notification block connecting the two blocks. When an alarm occurs, it's going directly into the Start block and then into the Notification block.



6. On the Notification block, you have to configure the [Alarm Notification Profile](#) that you are going to use and who you are going to send it to. You should have already configured your Alarm Notification Profile before creating your new pipeline.
7. In your pipeline workspace, click on the Notification block, and the Notification tab will open.
8. Choose which Notification Profile from the dropdown that you want to use: **Email**, **SMS** or **Voice**. You can see that all three profiles are configured, but for this example, choose **Email**.
9. In the Pipeline Block Editor, under Contacts, click the **On-Call Roster** icon on the right side. Select from users and groups who you want to notify about this alarm. Your **On-Call Roster** should have already been created before creating your pipeline.



You just created a very simple Alarm Pipeline. When this alarm becomes active, it goes directly to the Start block and notifies all the users in the Operator group via Email one time.

Pipelines don't do anything until an alarm is told to use it. Once you configure your Alarm Notification Pipeline, the next step is to tell your alarm to use your Notify pipeline when the alarm becomes **Active**, **Cleared** or **ACKnowledged**. How to make your alarm use a pipeline is covered in the next section.

#### Related Topics ...

- [Adding Pipelines to Tags](#)



# Pipeline Blocks

Pipeline blocks are the building blocks for the Alarm Pipeline Notification system. Each block has an input and zero or more outputs. Each block has its own unique functionality and performs a specific action for the pipeline, such as sending a notification, setting a property, or evaluating an expression.

Let's look at the different pipeline blocks that come with the Alarm Notification system. There are eight blocks above your Pipeline Workspace that you can choose from to build your alarm notification pipeline.

## Pipeline Blocks

The **Pipeline Blocks** are described individually in this section, but here is a brief overview:

- **Notification**  
Delivers a notification through the selected Notification Profile (i.e., Email, SMS and Voice).
- **Delay**  
Blocks the alarm event for the specified amount of time.
- **Splitter**  
Forwards a single event concurrently to multiple other blocks.
- **Switch**  
Evaluates a non-boolean Expression, and forwards to an output based on the result.
- **Expression**  
Evaluates an Expression that results in either 'True' or 'False,' and forwards the event to that output.
- **Set Property**  
Evaluates an Expression, and sets the result as a runtime property on the alarm event.
- **Jump**  
Forwards the alarm event to a different pipeline.
- **Script**  
Executes a task outside the pipeline.

## On this page ...

- [Pipeline Blocks](#)
- [Start Block](#)
- [Notification Block](#)
- [Delay Block](#)
- [Splitter Block](#)
- [Switch Block](#)
- [Expression Block](#)
  - Examples
- [Set Property Block](#)
  - Examples
- [Jump Block](#)
- [Script Block](#)



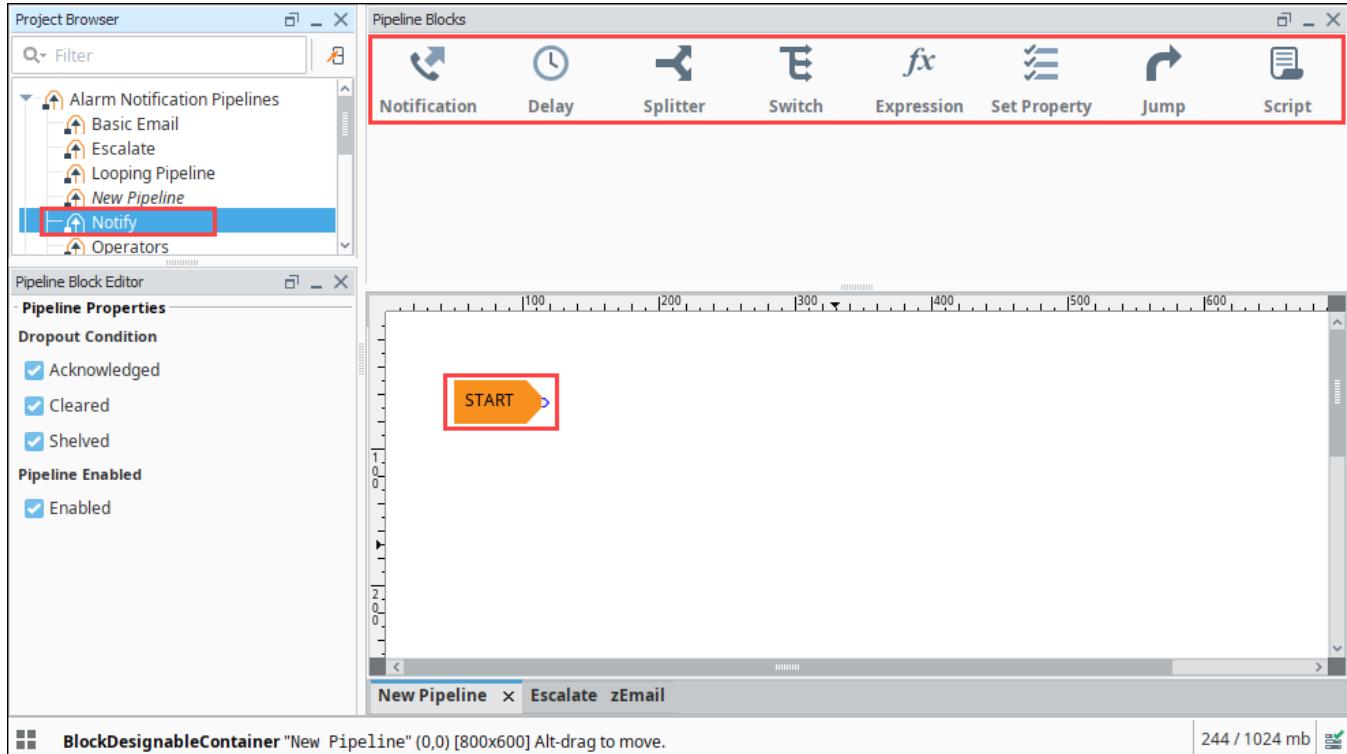
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## Pipeline Blocks

[Watch the Video](#)

## Start Block

When you create a new pipeline, you always get a **Start block** placed in your Pipeline Workspace. You cannot delete the **Start block** because it represents the entry point for alarm events into the pipeline.



## Notification Block

The **Notification block** is the block that controls the actual notification. When an alarm event reaches this block in the pipeline, some sort of notification will go out. In it, you can setup what type of notification it will use and who it will notify. You can learn more about the **Notification block** by going to the [Notification Block page](#).

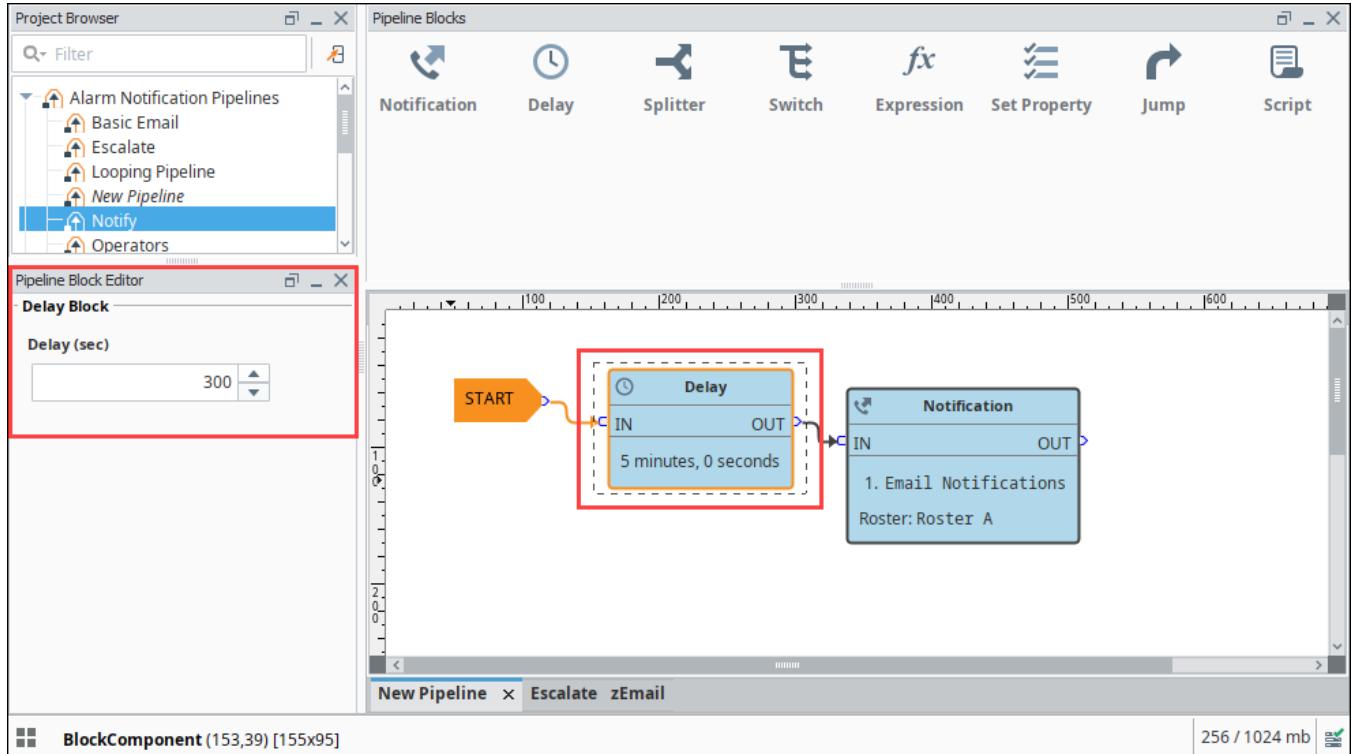
## Delay Block

The **Delay block** simply blocks alarm events for a specified period of time before moving them to the next block. They are generally used to wait for the dropout condition to become satisfied for an alarm.

For example, a 5 minute delay might be used to give operators viewing control screens a chance to acknowledge, and only send notifications if they haven't (the "active delay" deadband on the alarm could be used to delay the alarm as well, but in that case it wouldn't actually be active, and therefore not displayed, for the delay time).

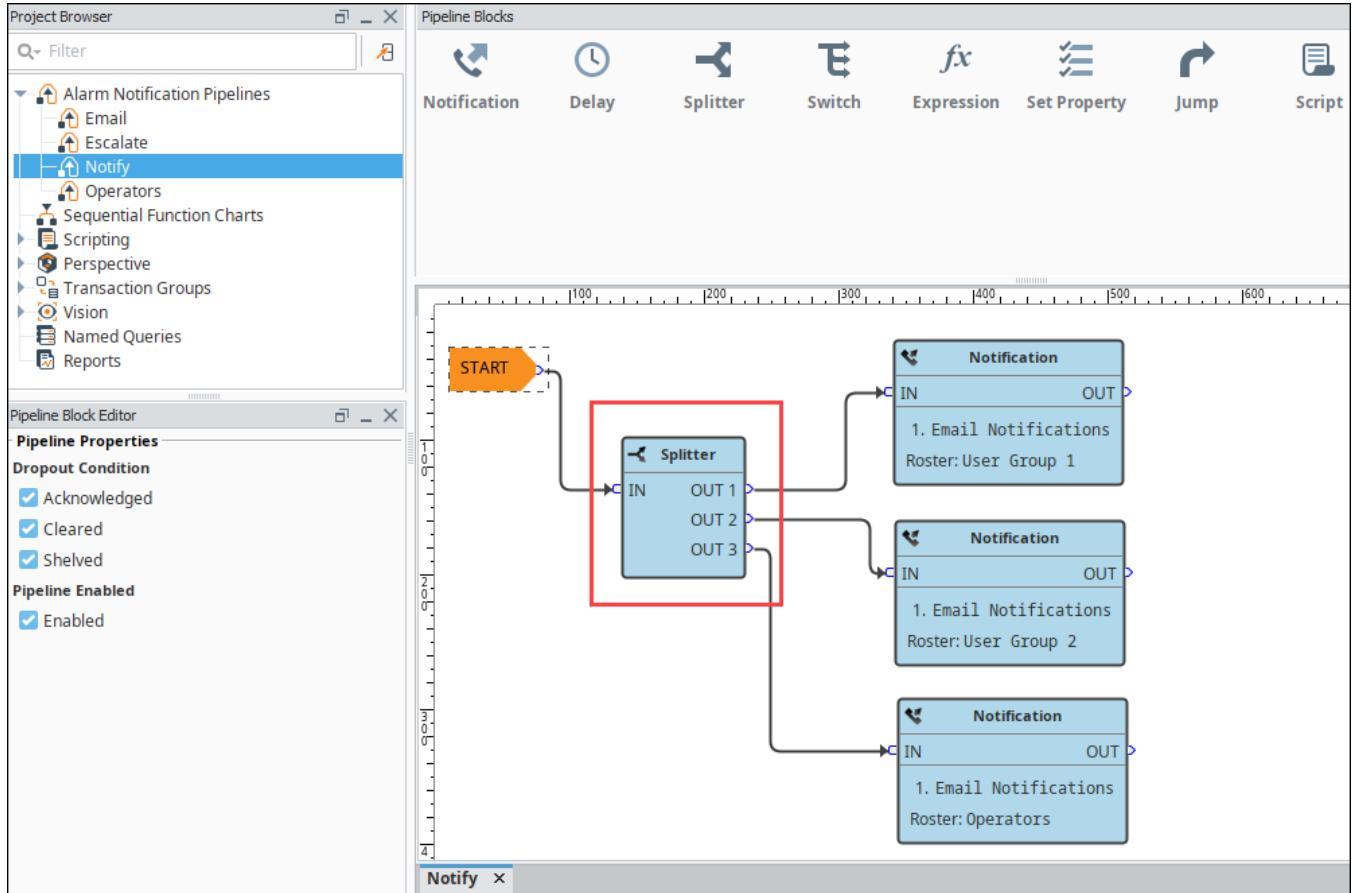
Delays are often also used to control flow in a pipeline. For example, in an "escalation" scenario, a notification block might be used to send emails. Since emails are sent instantly, and acknowledgment occurs "asynchronously" (the user must see the email and click the link or log into the system), a delay block could be used to provide time for the user to acknowledge, before moving on to a voice notification block. There is no practical limit to how long a delay can be. The delay is calculated independently for each event entering the block, meaning that each event will be held for the specified time.

Click the Delay block and a spinner will appear in the Pipeline Block Editor. You can specify the number of seconds to delay. In this example, if you enter "300" seconds, the alarm will wait 5 minutes before sending the notification to Roster A.



## Splitter Block

The **Splitter block** simply forwards a single alarm event to multiple outputs at the same time. It creates a copy of the alarm event for each output and executes the alarm notifications along multiple paths in parallel. You can specify as many outputs as you want. If care is not taken, it is possible to end up with an exponential number of alarm event copies active in the pipelines at one time. Since each notification block operates on a specific on-call roster, splitters are useful for delivering events to multiple notification blocks at once as shown in this example.

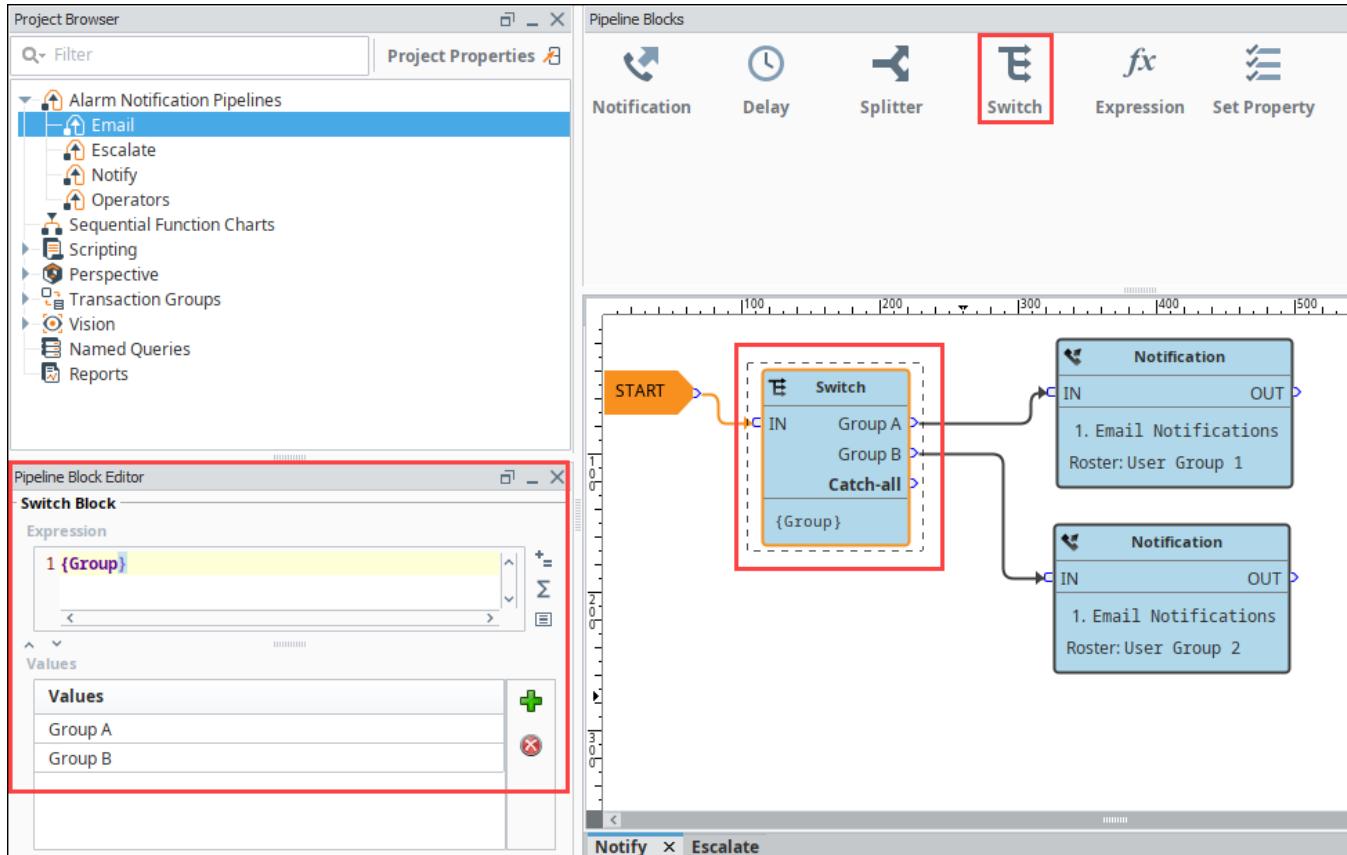


## Switch Block

The **Switch block** evaluates a non-boolean expression and forwards it to an output based on a given result. It can be a number or string, and it will be looked up against a defined list of expected results. If a match is found, the alarm will follow that path, otherwise the "Catch-all" output is used.

You can create an expression and even use the alarm event's priority, associated data, value and more. The following example has associated data for the Group that they belong to with "Group A" and "Group B" values. The Switch Block will evaluate the expression results against these defined values, and if a match is found, the alarm will follow that path. If neither of the values are met, the Catch-all output will be used.

This example demonstrates that a pipeline can send out an alarm to two different lists of people based on the group.



## Expression Block

The **Expression block** contains an Expression which is evaluated against each alarm that enters it. The result is expected to be a boolean value, either True or False and forwards the alarm to the specific output. The Expression executed by the block is written in the same syntax as other Expressions in Ignition. However, in this context, it is possible to refer directly to properties of the alarm event that is being evaluated by using the standard "{path}" reference syntax. In addition, the following functions are available to quickly determine the state of the alarm.

### Examples

```
isActive()
```

This single function returns whether the current event is active or not. An Expression block like this could be used to then dispatch to an "active" pipeline, and a "clear" pipeline (both the active and clear pipeline settings on the alarm would be set to this dispatch pipeline). This kind of setup allows you to later modify how actives are handled vs. clears in one place, without having to modify many alarms.

```
toInt({priority})>2 && {displayPath} like "*East Area"
```

This block would forward all High and Critical alarms from the "east area" to the true path. The others would go to false, which may not actually be bound to another block, making this Expression block act like a filter.

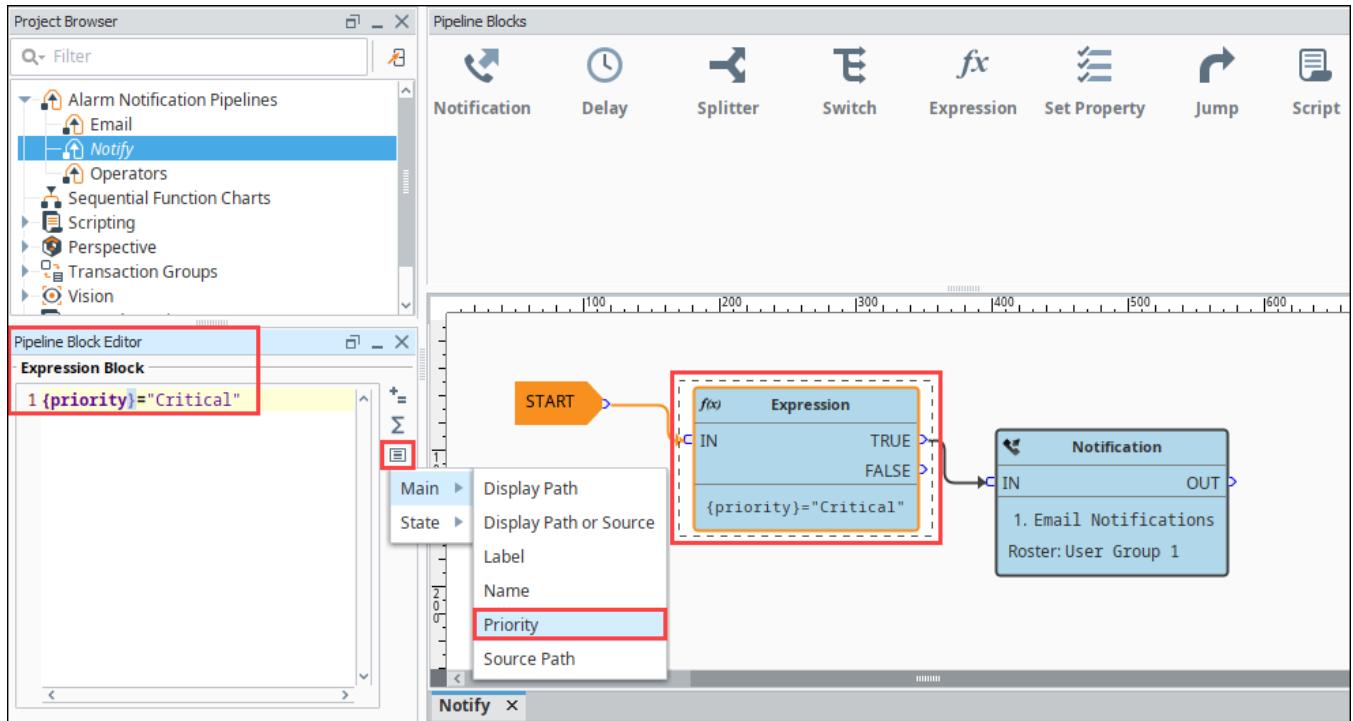
```
isPropertyDefined("isEscalated")
```

This Expression checks if a property exists on the event. The isEscalated property is not a system defined property. Instead, in this example, it might be set using a Set Property block before forwarding back to the start of the pipeline. The first time through, this Expression would fail, but the next time, it would pass, and the "escalated" behavior could be executed.

In the **Pipeline Block Editor**, you can select the Alarm Properties from any of the icons in the Expression block. This example uses an expression to check to see if the priority is Critical, and if so, the alarm notification will follow the True path. If it is not Critical, it will follow the False path. As you can see, the False output is not configured. You don't have to configure every output if you don't want to.

#### Priority Expression Example

```
{priority}="Critical"
```



## Set Property Block

The **Set Property block** allows you to define or redefine a property on the alarm event. The value is created from the Expression Block, which can refer to other properties or the same properties. Typically, the Set Property Block is used as a counter for the number of times the alarm has been looping or notifying people in your on-call roster. Settings modified in this way will only exist while the alarm is in the pipeline, they will not be stored to the journal, or show up in the status table.

### Examples

If you want to attempt notification up to three times before stopping, you could create a pipeline that looked like [Notification Block] > [Set Property] > [Expression], with the Expression looping back to the notification block (perhaps with a delay in between).

The Set Property block would look like:

Property Name: counter

Expression: coalesce({counter}, 0) + 1

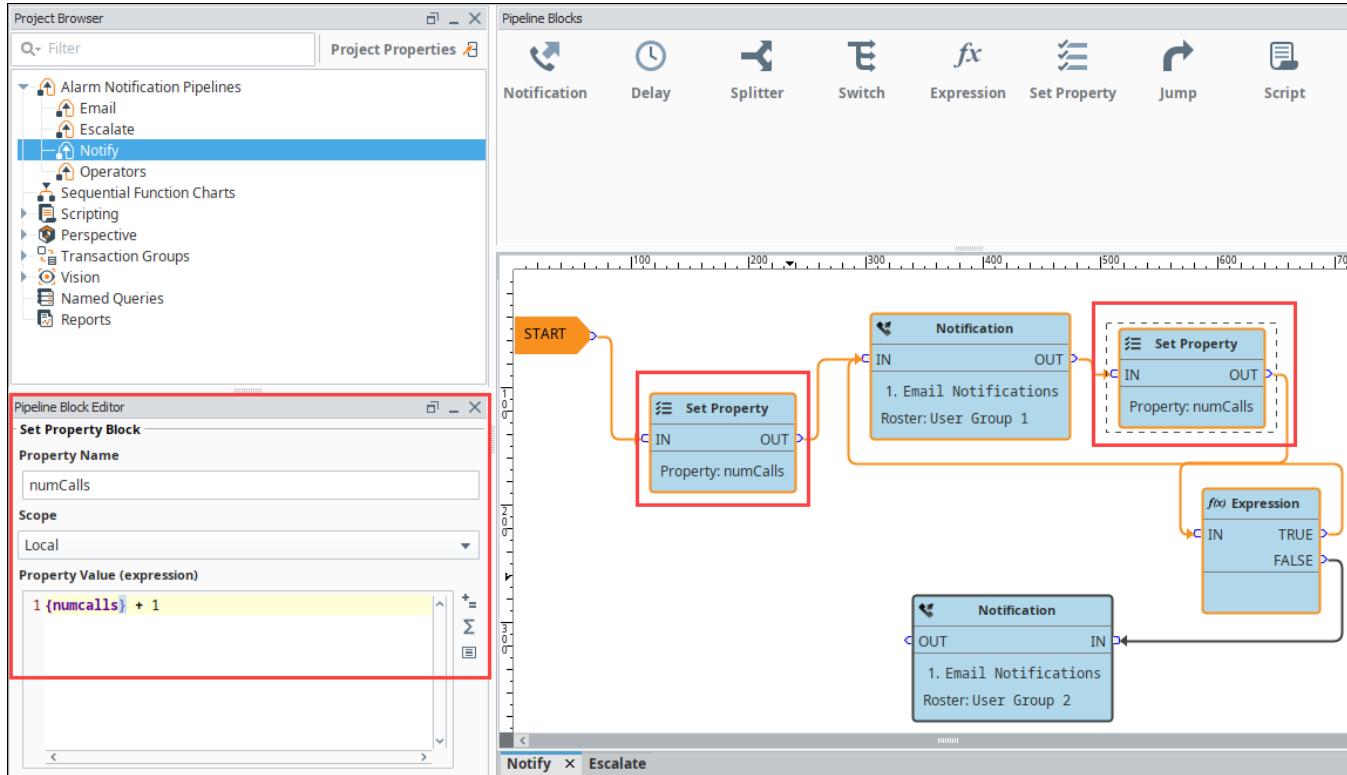
Note that the first time the block is hit, the `counter` property will not exist, and therefore the value will be null. The `coalesce` function returns the first non-null value, allowing us to start with 0. Another way to write this might be:

```
if(isPropertyDefined("counter"), getProperty("counter"), 0)+1
```

The `getProperty()` function is functionally equivalent to simply referencing the property in brackets (that is, `{counter}`).

The Expression block in this example would simply be: `{counter}<3`.

Here is another example where the operators are notified of an alarm event 3 times before being escalated to the Production Supervisors. Drag two Set Property blocks to your pipeline workspace. Assign the first Set Property block to a Property Name `numCalls` and a Property Value of "0". The second Property Block you need to increment the counter. Enter "`{numCalls} + 1`" as shown in the Pipeline Property Editor. Each time the alarm goes through this block, the `numCalls` variable increments by "1". If no one acknowledges the alarm, it is sent to the Production Supervisor's on-call roster.

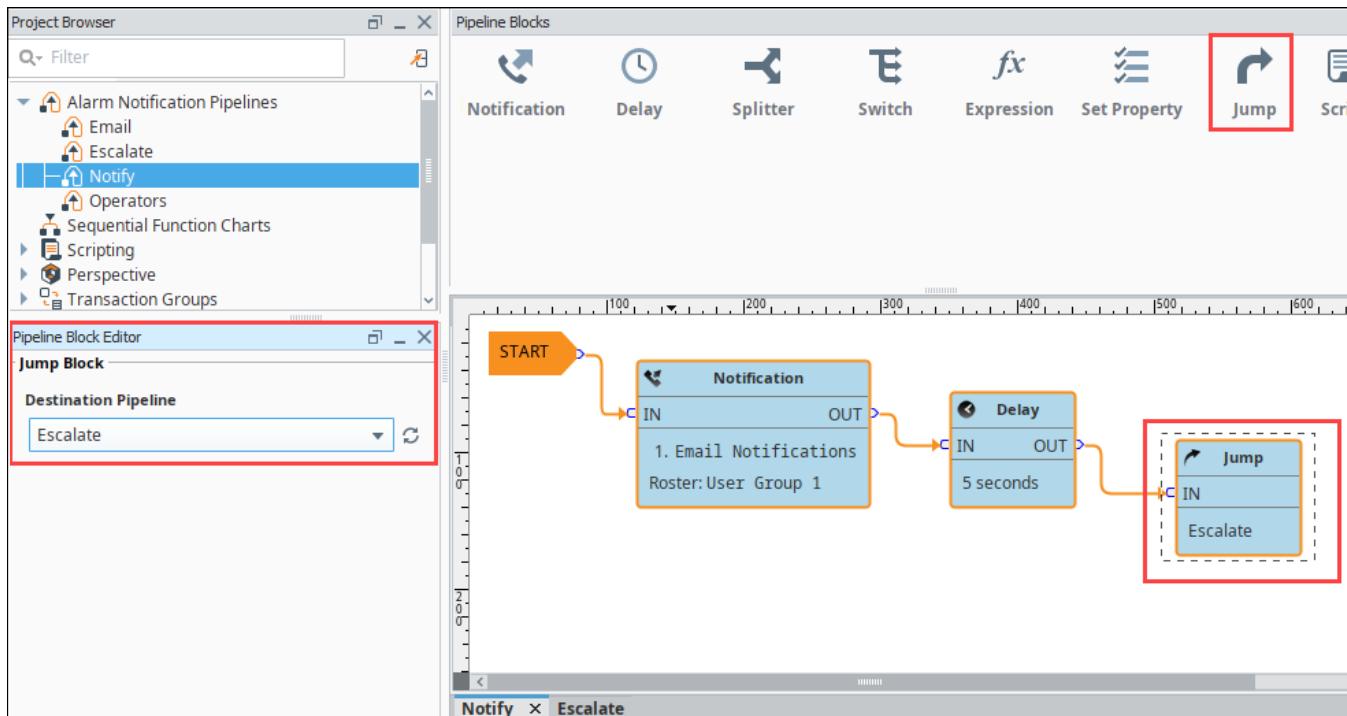


## Jump Block

The **Jump block** forwards an alarm event to a different pipeline. You can breakup a pipeline into several different pipelines and use the Jump Block to go back and forth between pipelines. This is perfect for an escalation pipeline because often times they can become one massive pipeline, and the Jump block can make the escalation pipeline less complicated and more compact.

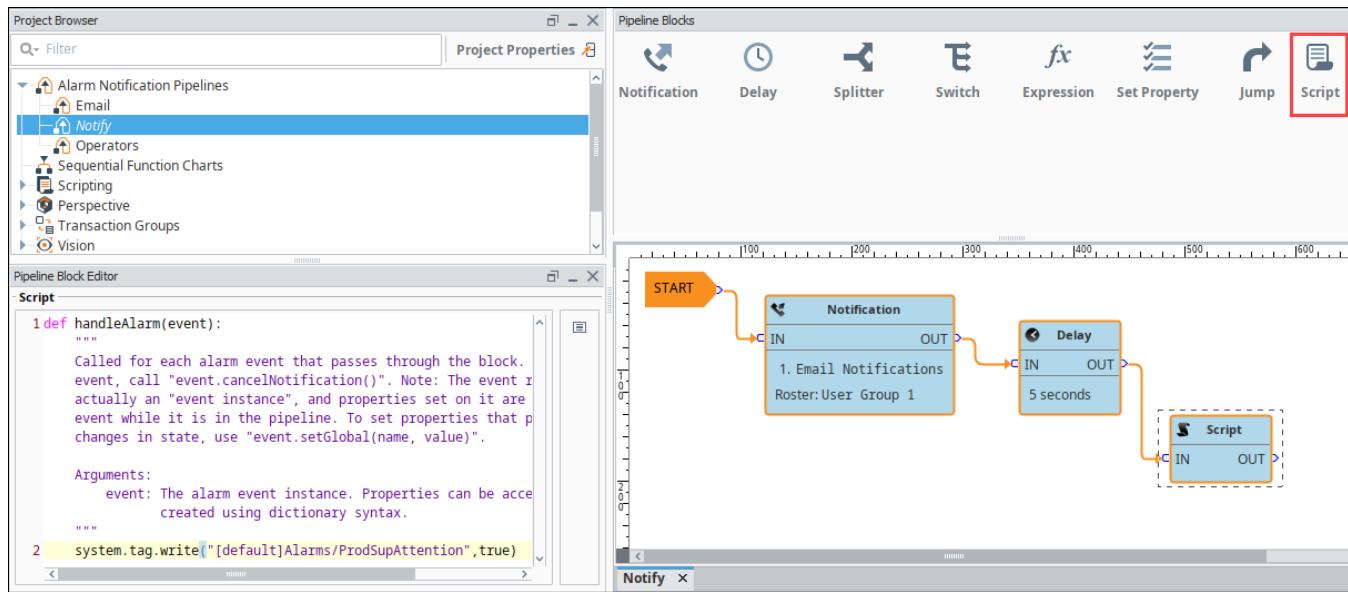
In the Pipeline Block Editor, enter the Destination pipeline called '**Escalate**.'

In this simple example, the Jump block forwards the alarm to the Escalate pipeline and ends there.



## Script Block

The **Script block** allows you to execute a task outside the pipeline like writing to another alarm tag or database. In this example, the Script block was used to notify the production supervisors of an alarm using another alarm tag as shown in the Pipeline Block Editor.



In the next sections, you will see how to use a combination of these different pipeline blocks to create your own unique pipelines.

### Related Topics ...

- [Pipeline - Filter on Alarm Priority](#)

### In This Section ...

# Notification Block

As the name suggests, the Notification block is responsible for sending notifications. Each notification block can target multiple notification profiles, which represents different methods of notification, but it will only notify the user on the first profile that the user has contact information for. So having a notification block with both email and SMS listed will first attempt to contact a person with the profile type listed first. If that fails because the user does not have contact information for that profile type, it will try the second profile. Each type of notification profile will have its own relevant properties for configuration, although some features are common to all profile types. The various profiles will also behave differently, according to their capabilities, in regards to how notifications are ordered. For example, the Email profile is capable of sending a message to many recipients at once, while the SMS and Voice notification profiles must step through each contact sequentially.

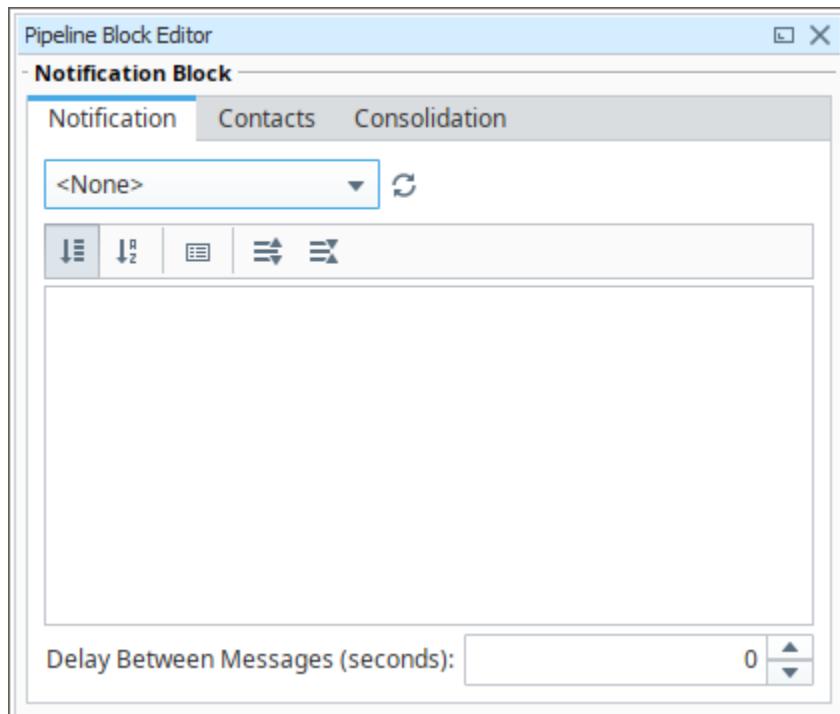
There are two required settings for notification blocks: the [Notification Profile](#) and the [On-Call Roster](#). The profile will dictate the method through which notifications occur, and the on-call roster will dictate who receives the notifications. The on-call roster provides an ordered list of contacts, which will first be pared down according to each user's schedule. The resulting contacts will be notified in order, based on how the profile operates. The settings displayed will depend on the type of profile selected.

## On this page ...

- [Notification](#)
  - [Email Settings](#)
  - [Voice Settings](#)
  - [SMS Settings](#)
  - [Twilio Settings](#)
  - [Message Properties](#)
- [Contacts](#)
  - [Direct](#)
  - [Expression](#)
  - [Calculated](#)
  - [Accessing Alarm Properties](#)
  - [Building a Roster](#)
- [Consolidation](#)
  - [Consolidated Message Property](#)
  - [HTML Formatting in Email Notifications](#)

## Notification

The Notification tab allows you to select which [Notification profile](#) you would like to use of the ones that you have currently configured in your Gateway. The settings that can be configured differ, depending on the type of Notification profile selected. However, all of the notification types share a setting, outside of the property area called **Delay Between Messages**. This property allows you to set a delay that will happen in between each notification. So if your delay is set to 30 seconds on an email notification, it will email the first person in the roster and then wait for 30 seconds before emailing the next person. It is set to zero seconds by default.

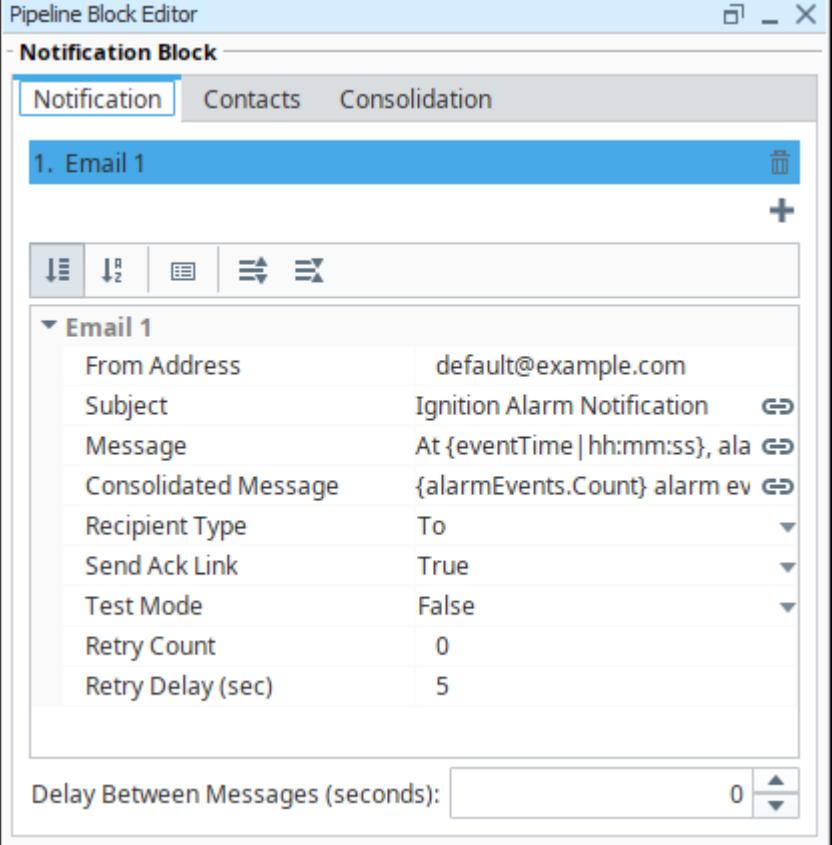


## Email Settings

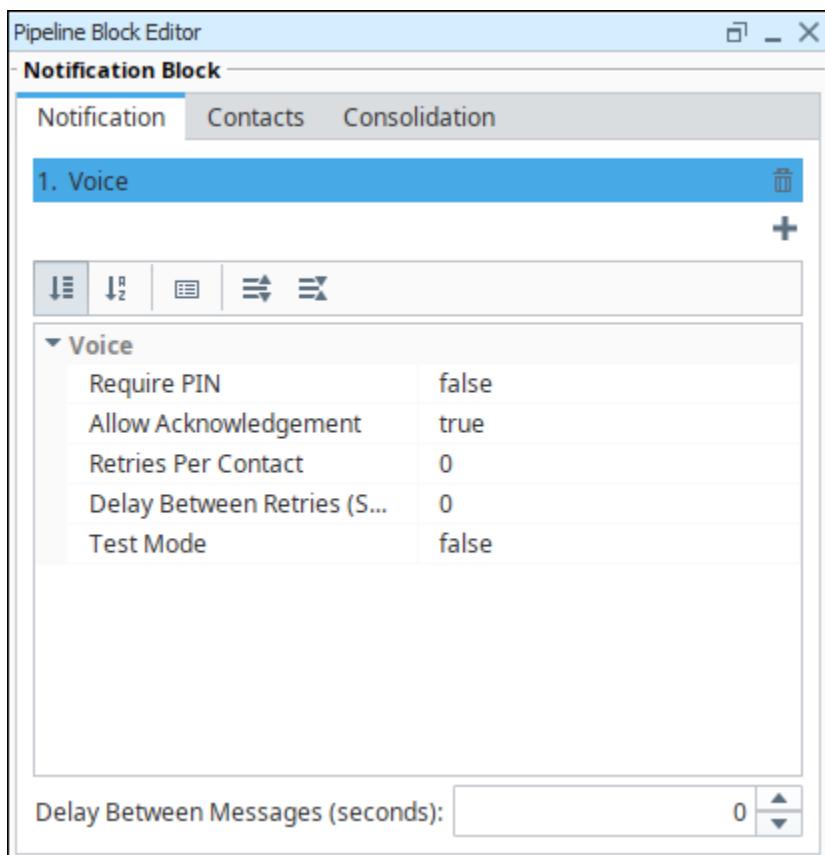
Setting	Description
---------	-------------

From Address	Email address used for the From field.
Subject	Subject of the email.
Message	<p>The body of the email. Like the subject, may refer to properties of the alarm. Message supports HTML formatting. Simply add the &lt;html&gt; tag at the beginning of the Message property. An end tag (&lt;/html&gt;) is not required.</p> <pre>&lt;html&gt;This is my message. &lt;br&gt;That was a line break.</pre>
Consolidated Message	The message sent when consolidation is turned on, and more than one alarm is being sent. See the <a href="#">Notification Block#Consolidation</a> section for more details.
Recipient Type	Determines if the email is sent to the user via "To", "CC", or "BCC".
Send Ack Link	Allows the notification block to override the acknowledgment link that's included with <a href="#">two way email notification</a> , potentially hiding it. If Two-way notification is enabled on the email notification profile, and this property is false, then emails sent by the block will not include an acknowledgement link.
Test Mode	If enabled, logs to the console each time an email would be sent, instead of sending the actual email.
Retry Count	The number of retry attempts per email per alarm. Default is 0.
Retry Delay	Introduces a delay between each email for each alarm. Default is 5.

## Voice Settings

Setting	Description
Require PIN	

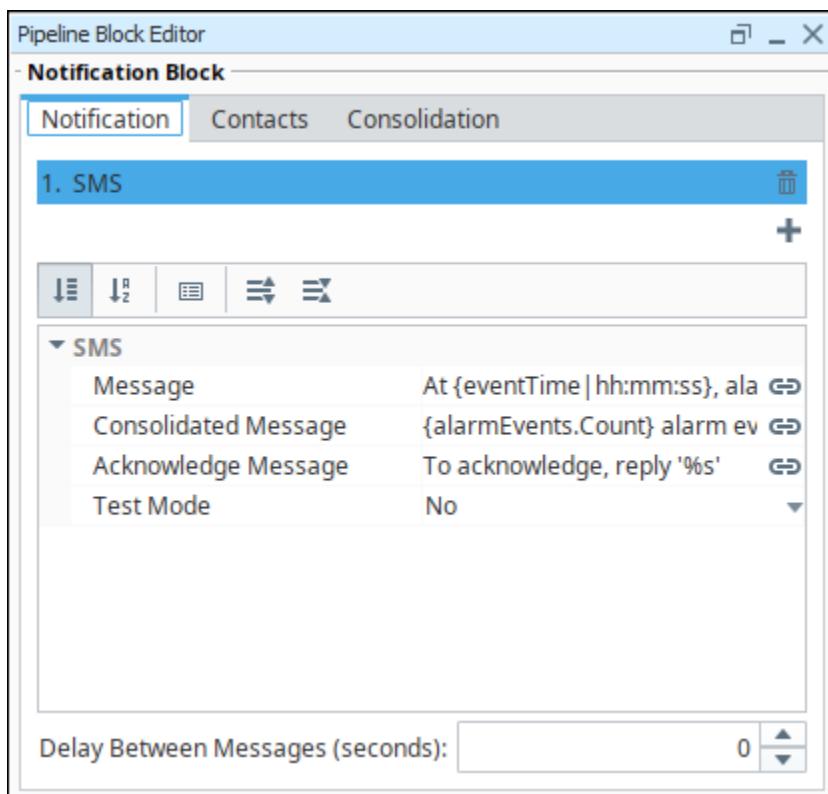
	If true, the user will need to enter their PIN in order to hear the alarm notification messages. The user's PIN is defined in the user management section of the Gateway. If false, then anyone will be allowed to hear the messages after answering the phone.	
Allow Acknowledgment	If false, users will only be allowed to listen to alarms, not to acknowledge them.	
Retries Per Contact	The number of retry attempts per contact per alarm. Default is 1.	
Delay Between Retries	<p>Introduces a delay between calling each contact, for each alarm. The pipeline dropout conditions are checked regularly between calls and while waiting, so this would provide time for the alarm to drop out before calling the next person. The delay is only enforced after following a "successful" call (a call that was answered). Unanswered or errored calls will move on to the next contact right away.</p> <p><b>Caution:</b> Long delays can block other alarms in the call queue.</p> <p>The delay is applied to all contacts for a particular alarm. The system must have time between each call to hang up properly before dialing again.</p> <p><b>Note:</b> For most phone systems, a delay of at least 1 second is advised.</p>	
Test Mode	If enabled, messages will be logged to the console indicating when and to whom calls would have been made, without actually making a call.	



## SMS Settings

Setting	Description
Message	The message to use for single events.

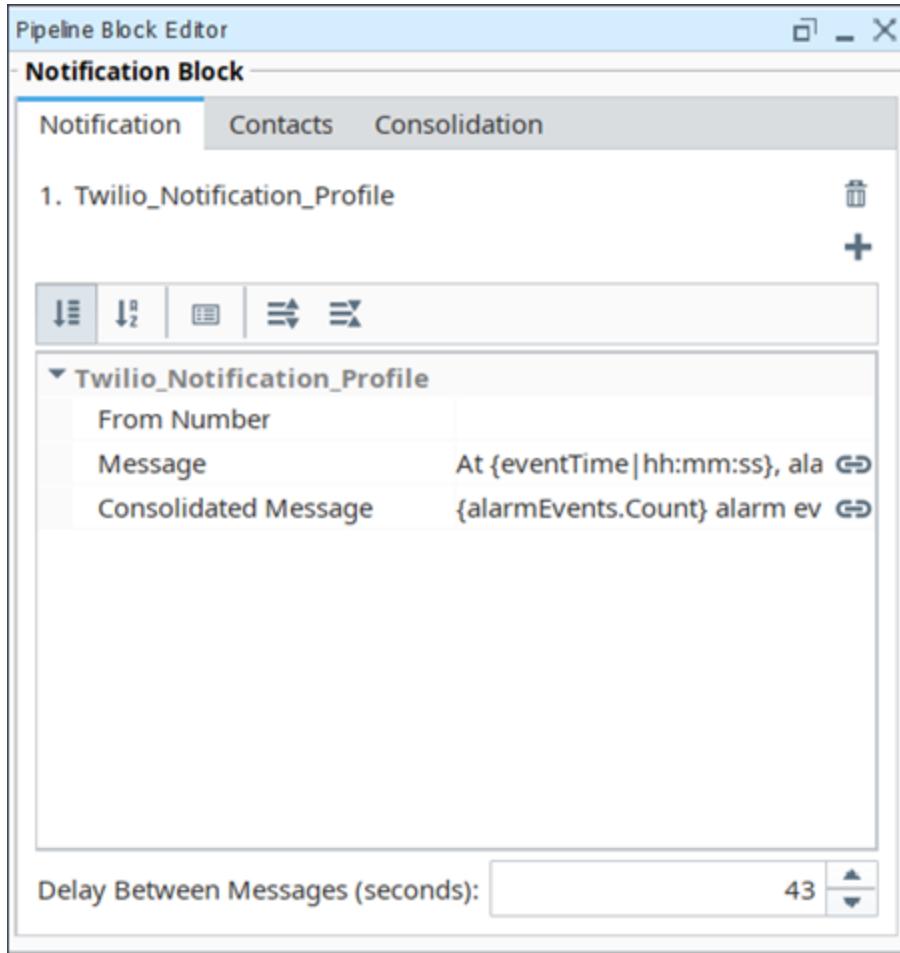
Consolidated Message	The message sent when <a href="#">consolidation</a> is turned on, and more than one alarm is being sent. See the <a href="#">Notification Block#Consolidation</a> section for more details.
Delay Between Notification	As with voice, a delay between each message sent, to give the recipient time to acknowledge and prevent further notification.
Acknowledge Message	When two-way SMS notification is enabled, this property allows for the configuration of the acknowledgment instructions the users receive in the notification. The '%s' will be replaced by the user's acknowledge code.
Test Mode	If enabled, logs messages that would have been sent to the Gateway console, and does not actually send them.



## Twilio Settings

SMS notifications can also be sent with the [Twilio Alarm Notification](#) module. To use Twilio, you must first set up [Twilio SMS Notification](#). This does not require a cellular modem, but the [Gateway](#) must have Internet access, and a Twilio account with [SMS](#) capabilities must be created ([www.twilio.com](http://www.twilio.com)).

Setting	Description
From Number	Number from which the alarm notification is sent.
Message	Message to send. Default is "At {eventTime hh:mm:ss}, alarm "{name}" at "{displayPath}" transitioned to {eventState}." Click the <b>binding</b> icon to access other alarm properties that can be used to the message.
Consolidated Message	<p>This feature is new in Ignition version <b>8.1.2</b>  <a href="#">Click here</a> to check out the other new features</p> <p>The message sent when consolidation is turned on, and more than one alarm is being sent. See the <a href="#">Notification Block#Consolidation</a> section for more details. In release 8.1.2 this setting was renamed from "Throttled Message" to "Consolidated Message."</p>



## Message Properties

The email, SMS notification, and Twilio notification types have a few different message settings. There are properties that contain alarm values that can be used in these message settings. To use the property, place {} around it. The table below contains all of the properties available to them.

Property Name	Property Display Name	Description
Count	{AlarmEvents.Count}	The number of alarm events that are in the pipeline. Typically used with alarm consolidation.
Maximum Priority	{AlarmEvents.MaxPriority}	The maximum priority of the alarms in the pipeline. Typically used with alarm consolidation.
Minimum Priority	{AlarmEvents.MinPriority}	The minimum priority of the alarms in the pipeline. Typically used with alarm consolidation.
Display Path	{displayPath}	The display path of the alarm.
Display Path or Source	{displayPathOrSource}	The display path of the alarm, or the sourcepath if no display path was defined.
Name	{name}	The name of the alarm.
Priority	{priority}	The priority of the alarm.
Source Path	{source}	The source path of the alarm.
Ack Time	{ackTime}	The time when the alarm was acknowledged.
Ack'd By	{ackUser}	The username of the person that acknowledged the alarm.
Ack'd By (Name)	{ackUserName}	The name of the person that acknowledged the alarm.
Acked?	{isAcked}	A True or False on if the alarm is acknowledged.

Active Time	{activeTime}	The time the alarm went active.
Active?	{isActive}	A True or False on if the alarm is active.
Clear Time	{clearTime}	The time the alarm went to a cleared state.
Clear?	{isClear}	A True or False on if the alarm is cleared.
Current State	{state}	The current state of the alarm. (Active, Unacknowledged/Active, Acknowledged/Cleared, Unacknowledged/Cleared, Acknowledged)
Event State	{eventState}	The state of the alarm event. (Active, Acknowledged, Cleared)
Event Time	{eventTime}	The time that the alarm event occurred. Can format the time to a specific format like {eventTime hh:mm:ss}
Event Value	{eventValue}	The value of the tag for the alarm event.
Is Shelved?	{isShelved}	Is the alarm shelved.

## Contacts

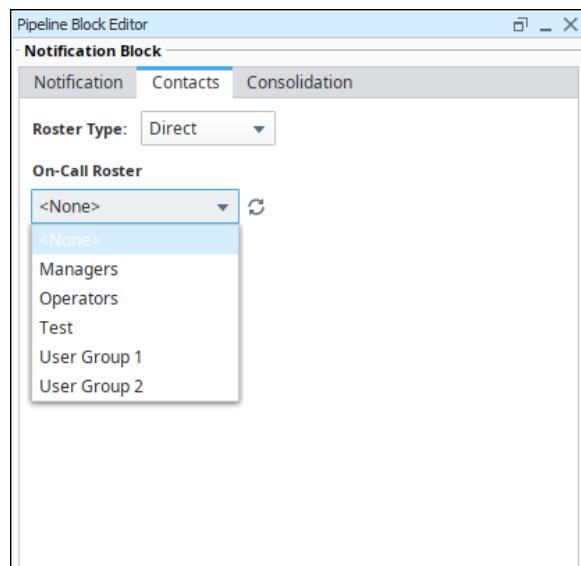
From the **Contacts** tab, you can specify who you want to send the alarm notification to by specifying what **roster** type you want to use. There are three different ways to setup a roster.

- **Direct** - Set a specific roster to use.
- **Expression** - Set up an expression that will determine which roster to use.
- **Calculated** - Use scripting to build a roster within the pipeline.

Each has different advantages, so it's important to understand the difference so you can select the method that best fits your needs.

### Direct

The Direct roster type is the simplest to setup and use, but also the least flexible. Any On Call Roster defined on the Gateway can be used directly.



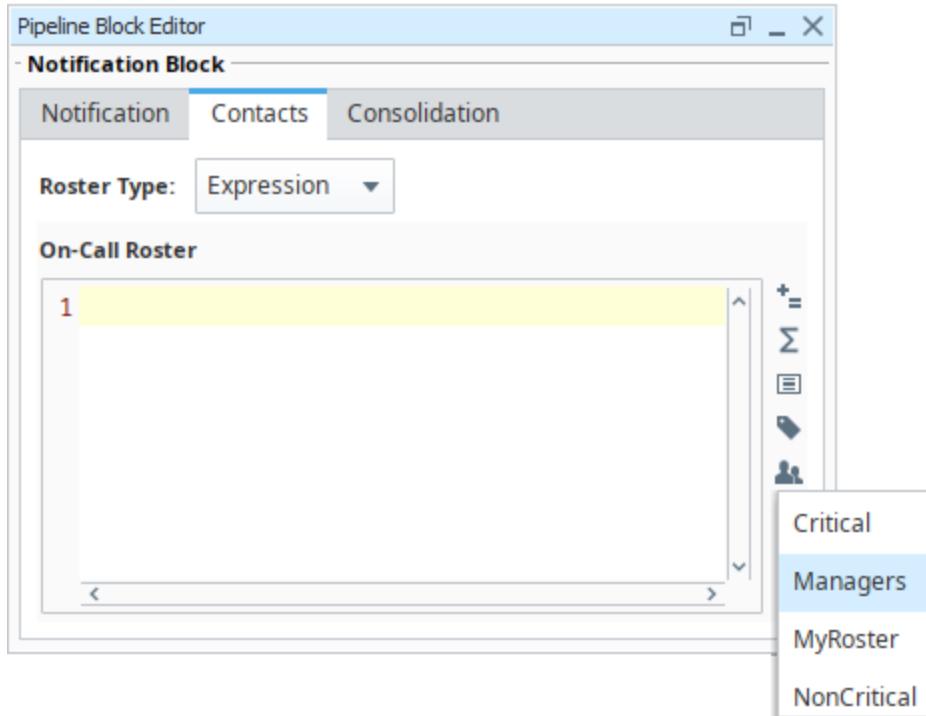
### Expression

The Expression roster type makes it possible to dynamically choose a single, predefined roster from within the pipeline. The expression can make use of Tag values, alarm properties and associated data. The alarm properties are accessible from the **Alarm Properties** icon located on the right side of the panel. Associated data can be manually entered using the "{" and "}" characters. A list of rosters is available from the **On-Call Rosters** icon.



### Dynamic Rosters

[Watch the Video](#)



```
if({Group} = "A", "Group A", "Group B")
```

The above expression checks for associated data named "Group" on the alarm. If the value is equal to "A", the Group A roster is used, otherwise the Group B roster will be notified.

### When should I use quotation marks on the Roster name?

It is recommended to **always place quotation marks around roster names**. However, it is not always required for notifications to be sent out successfully.

If the expression consists of only the name of the roster, then quotes can be omitted. For example, specifying that a Notification block should always use the Roster named "**Operators**" could look like the following with quotes:

```
//This expression will evaluate successfully.  
"Operators"
```

Which would return the string **Operators**, a valid Roster.

However, quotation marks could be removed in this scenario. This normally causes a syntax error, because strings in expressions must be encased in quotation marks. However, in this case the Notification block will assume you simply typed out the name of the roster, so the following example will also successfully use the **Operators** roster:

```
//This will fail to evaluate as an expression, so the block will instead look for a roster named  
"Operators",  
//and the users will still be notified.  
Operators
```

However, if the expression is any more complicated than the above example, such as using an expression function, then quotation marks must be used. The following example would check the priority of the alarm. If the alarm's priority was "critical", then the **High Priority Roster** would be notified. For all other priorities, the **Low Priority Roster** would be used.

```
//This expression will evaluate successfully.  
if({priority} > 3, "High Priority Roster", "Low Priority Roster")
```

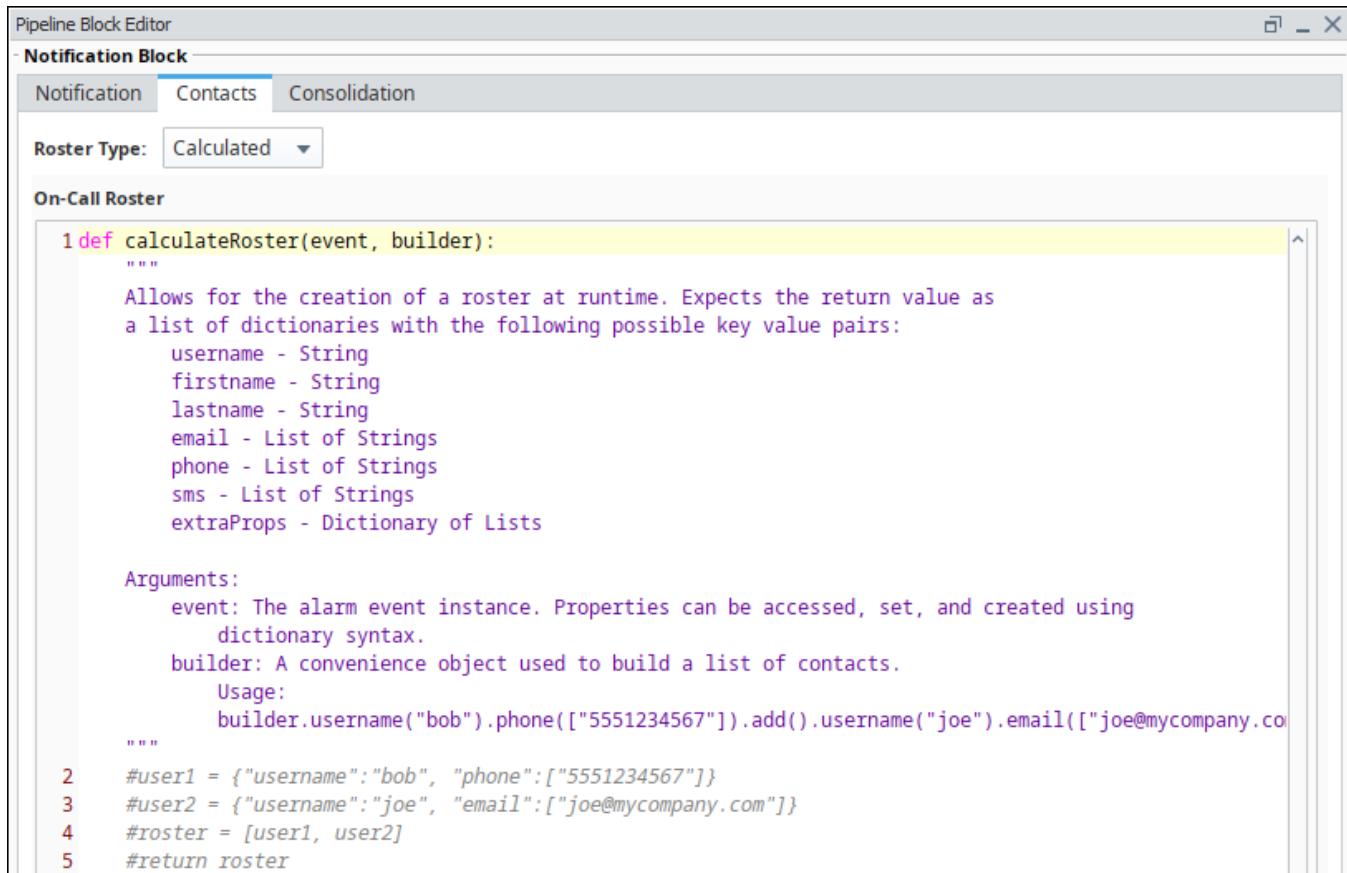
However, if the quotes were removed from the roster names, the expression would fail with a syntax error:

```
//This expression will fail, so all the text is assumed to be the name of a Roster  
if({priority} > 3, High Priority Roster, Low Priority Roster)
```

When this expression fails, the Notification block will assume that the text is actually the name of a roster, and will attempt to use a roster named "**if({priority} > 3, High Priority Roster, Low Priority Roster)**". For this reason, it is a good idea to always place quotes around Roster names, as well as check your expressions for syntax errors.

## Calculated

The Calculated roster type allows you to use scripting to create a roster at that time using scripting. This becomes extremely useful for situations when you are not sure who should be contacted at the time. Instead of creating an on-call roster for each possible combination of users, you can determine who needs to be notified in the script based on the circumstances of the alarm, and then build the roster to fit that scenario. While this is extremely powerful and offers the most flexibility, it is the most difficult to configure, so you should only use it when absolutely necessary.



## Accessing Alarm Properties

You can access any of the alarm properties through the event object in a calculated roster. Properties are stored as a dictionary and can be accessed in the same way.

### Alarm Properties

```
# properties can be accessed directly using the dictionary format  
# event["propertynname"]  
  
# get the alarm name  
alarmName = event["name"]  
  
# get an associated data property named "Machine Area"  
associatedArea = event["Machine Area"]
```

## Building a Roster

The Calculated roster type requires a return value which is a list of dictionaries, where each dictionary is a set of contact information. The contacts that you use are specific to that instance, meaning neither the user nor contact information have to exist on the Gateway. This can either be done manually, by putting together dictionaries with the appropriate contact info and then placing them into a list, or you can use the builder to put together the list for you. Both end up with the same results, so we advise that you use the one that you find easier. The builder has a set of methods which align with the key:value pairs the dictionary is expecting.

Name	Description	Data Type
username	A username for this particular user.  <b>Note:</b> This can be anything that you want, the user does not have to exist in the Gateway. It will be used for acknowledgement and auditing purposes, so it is important you create meaningful usernames.	String
firstname	A first name for this particular user.	String
lastname	A last name for this particular user.	String
email	A list of possible email address for the user.	List of Strings
phone	A list of possible phone numbers for the user for voice notification purposes.	List of Strings
sms	A list of possible SMS numbers for the user for SMS notification purposes.	List of Strings
extraProps	Extra properties that can be added to a user. This is useful when dealing with any third party functionality.	Dictionary of Lists

## User Data Created Manually

When putting together a [dictionary](#) manually, you can use some or all of the properties listed in the table above. You can create as many dictionaries of users as you want, adding in as much or as little contact info. Once you have your dictionaries created, you then need to place them in a list. You then need to use that list as the return value, which the pipeline will use to determine who to contact.

### Manual User List

```
# create your user dictionaries
user1 = {"username": "mary", "email": ["mary@company.com"]}
user2 = {"username": "john", "firstname": "John", "lastname": "Smith", "email": ["john@company.com"], "phone": ["1234567890"], "sms": ["8905671234"]}

# create a list of the user data
userList = [user1, user2]

# return the user data
return userList
```

You can use this in conjunction with a database query to dynamically create a list of user information. See below for an example using the Builder.

## User Data Created with the Builder

If you opt instead to use the builder, the builder object has a few extra methods that it can use besides what were listed above.

- `add()` - Adds all previous info as a single dictionary.
- `build()` - Returns the completed list of dictionaries.

The builder object is used by calling consecutive methods on it. Using the same info as the example above, you can add all of the contact info to the builder on a single line.

### One Big Builder

```
# Here, we are putting together contact information in our builder using one big string of code.
# Notice that even though it is one long string of code, we are adding both users.
# The first add() at the end of Mary's information acts as a divider between the details, adding hers first.
# The second add() at the end of the code will then add all of John's information.
```

```
builder.username("mary").email(['mary@company.com']).add().username('john').firstname('John').lastname('Smith').email(['john@comapny.com']).phone(['1234567890']).sms(['8905671234']).add()
```

While the above will work just fine, it may be a bit confusing to put together. However, you don't have to add all of the users at once like that. You can instead break it up, making sure to call add at the end of each user's information.

### **Breaking up the Builder**

```
# Here, I still add all of the same contact information to my builder, but this time, I do it in two stages.
# The difference here is that I have to call builder again in the second line when adding John's information.
builder.username("mary").email(['mary@company.com']).add()
builder.username('john').firstname('John').lastname('Smith').email(['john@comapny.com']).phone(['1234567890']).sms(['8905671234']).add()
```

This can be really useful as it can allow you to add users one at a time, making use of flow control methods like a for loop. You can then use external information, such as database records or Ignition's built in user and security functions to determine who to add.

### **Looping through Users**

```
# This would grab a table from the database that contains a username, email address, and SMS number.
# We must specify the database connection name because this is in the gateway scope.
data = system.db.runQuery("SELECT username, emailaddress, smsnumber FROM user_info_table", "DB")

# loop through the returned query data
for row in data:
    # add users to the builder row by row
    # note the extra [] in the email and sms functions
    builder.username(row["username"]).email([row["emailaddress"]]).sms([row["smsnumber"]]).add()
```

Once you have all of the appropriate contact information added to the builder, you then call build() on the builder object. This will give us a new built object. We then return our userList as before. Using our example from above:

### **Complete Builder Example**

```
# get the alarm name property
alarmName = event["name"]

# don't send notification for some alarms
if alarmName in ["Diagnostic Alarm", "Joe's Test Alarm"]:
    # return an empty list so no one will be emailed
    return []

else:
    # get user information from the database
    data = system.db.runQuery("SELECT username, emailaddress, smsnumber FROM user_info_table", "DB")

    # loop through the returned query data
    for row in data:
        # add each user to the builder
        builder.username(row["username"]).email([row["emailaddress"]]).sms([row["smsnumber"]]).add()

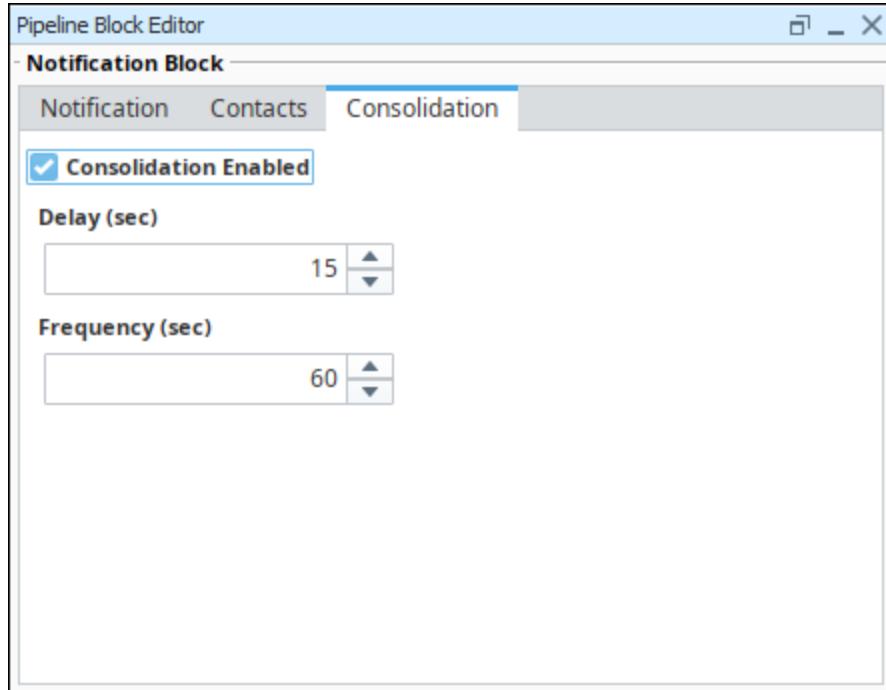
    # use the builder object's build() function to create the finished list of data
userList = builder.build()
return userList
```

## **Consolidation**

Notification consolidation allows you to limit the number of notifications sent by specifying a delay during which incoming events will be collected. When the delay expires, all events that have arrived during the period of time will be sent together to the notification profile. The manner in which the profile implements consolidation will vary, but in general the result will be a shorter message, or fewer messages, than would have occurred otherwise.

Consolidation is defined with two parameters:

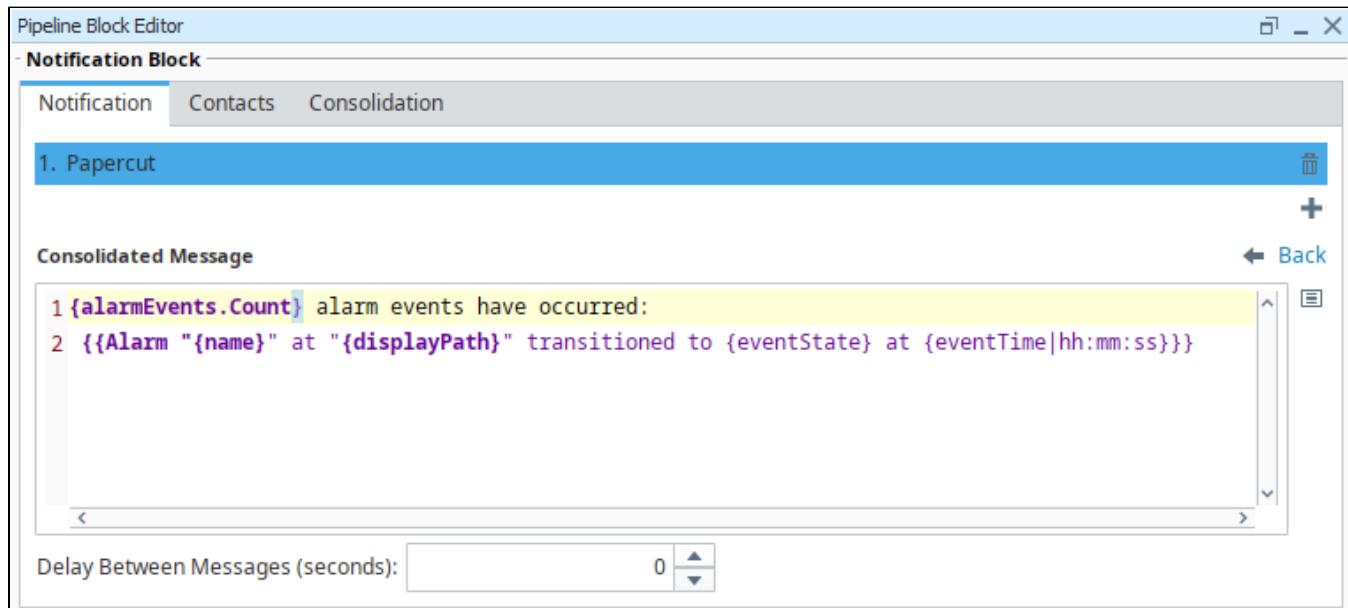
- **Delay** - How long to wait after the first eligible alarm arrives. This setting forces a pause *before* sending a notification. The delay is used to protect against situations where an event might generate many alarms together. In other words, if an alarm comes into the Notification Block, it will be delayed for this amount of time in case there are other alarms arriving soon.
- **Frequency** - The max frequency with which the profile can send alarms. This setting forces a pause *after* sending a notification. The frequency is used to ensure that contacts aren't notified too often, for example if an alarm is rapidly going in and out of the active state.



## Consolidated Message Property

Some notification settings include a **Consolidated Message**, which dictates the formatting for the message when consolidation is enabled. This property features a text area that allows you to determine the content of the consolidated message.

**Note:** While the editor looks like an Expression Editor, it's not, so the normal expression functions and rules do not apply here. Although there is a Property Reference button to the right of the editor that can create references to alarm event properties. Since this isn't an expression, you don't need to wrap string literals in quotation marks.



Since consolidated messages will potentially contain multiple alarms, they utilize some unique syntax: the double curly bracket {{ }} notation. The content within this notation will be repeated for each alarm included in the consolidated notification.

```
{alarmEvents.Count} alarm events have occurred:  
{{Every thing in here will be repeated for each alarm included in the consolidated notification}}
```

## HTML Formatting in Email Notifications

Messages within consolidated messages can use HTML formatting by simply leading with an <html> tag at the start of the message. Doing this by itself does cause the resulting formatting to omit the built-in line breaks, so you will need to add line break <br> tags to signify a new line.

For example, we could add some HTML tags to the initial example on a consolidated message to write the alarm name and display path in bold <b>

```
<html>  
{alarmEvents.Count} alarm events have occurred: <br>  
{{Alarm <b>{name}</b> at <b>{displayPath}</b> transitioned to {eventState} at {eventTime|hh:mm:ss} <br>}}
```

Which would result in the following body:

The screenshot shows the Papercut application interface. At the top, there's a header bar with icons for Log, Rules, Options, and Exit. Below the header, a sidebar on the left displays "Ignition Alarm Notific." and the date "10/13/2020 3:33:10 PM (831)". The main area contains an email message with the following details:

From	default@example.com
To	stuff@thing.com
Date	10/13/2020 3:33:10 PM -07:00
Subject	Ignition Alarm Notification

The message body is as follows:

6 alarm events have occurred:  
**Alarm Fault** at **Alarm Fault** transitioned to Active at 03:32:55  
**Alarm Fault** at **Alarm Fault** transitioned to Active at 03:32:55  
**Alarm Fault** at **Alarm Fault** transitioned to Active at 03:32:55  
**Alarm Fault** at **Alarm Fault** transitioned to Active at 03:32:55  
**Alarm Fault** at **Alarm Fault** transitioned to Active at 03:32:55  
**Alarm Fault** at **Alarm Fault** transitioned to Active at 03:32:55

At the bottom of the message screen, there are buttons for FORWARD and DELETE (1). To the right of the message area, there's a footer with the Papercut logo and the text "Papercut v5.1.76" and a GitHub link: <https://github.com/ChangemakerStudios/Papercut>.

# Pipeline - Filter on Alarm Priority

**Note:** To learn more, go to [Configuring Alarms, Alarm Notification and On-call Rosters](#).

You can create a filter for an alarm priority in an alarm notification pipeline that notifies a different list of users based on the alarm's priority.

There are two **pipeline blocks** that can be used for filtering, either the **Switch block** or the **Expression block**. The Switch block allows you to switch on the priority, doing something different for every single priority that exists. The Expression block allows you to check for a specific priority, and it returns either a 'True' or 'False' value. You can do something if it is 'True' and something else if it is 'False.' This example uses the Expression block. In this example, we already have two On-Call Rosters set up named "Critical" and "NonCritical."

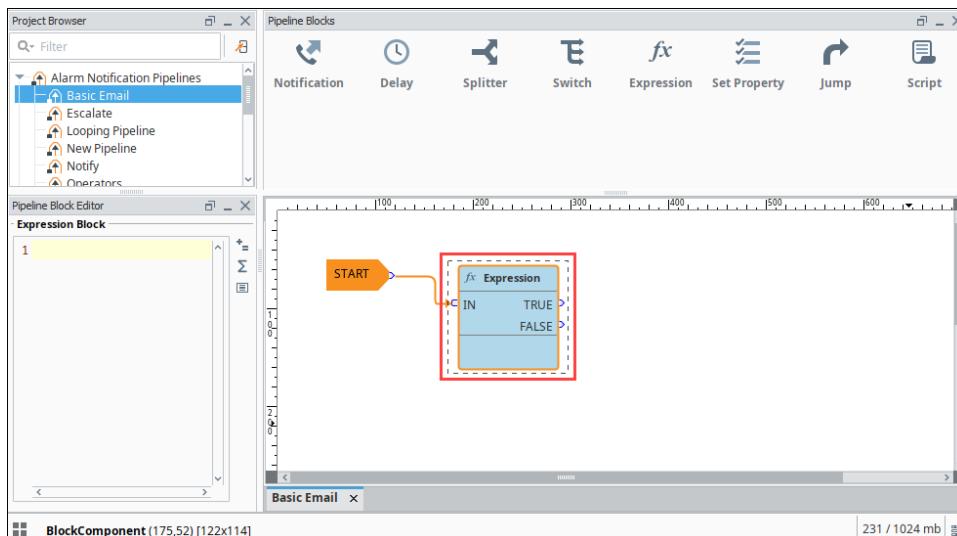


## Pipeline - Filter on Alarm Priority

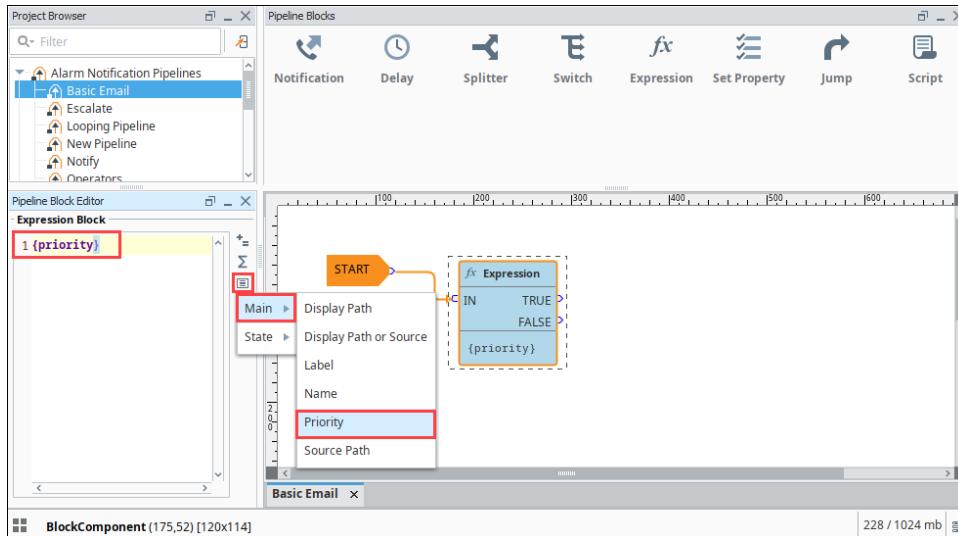
[Watch the Video](#)

To Filter on Alarm Priority, do the following:

1. Drag an **Expression block** into your pipeline.
2. Connect the **Start** to the **IN** of the Expression block. You will notice that the Expression block is going to return a **True** or **False** value.



3. In this expression, you want to check for the alarm's priority. Go to the Pipeline Property Editor, click the **Alarm Properties** icon.
4. Select **Main** and then the **Priority** expression. **Priority** is a placeholder until you enter the priority value you want to filter on. When the alarm is triggered, it will be replaced with the actual priority of that alarm.



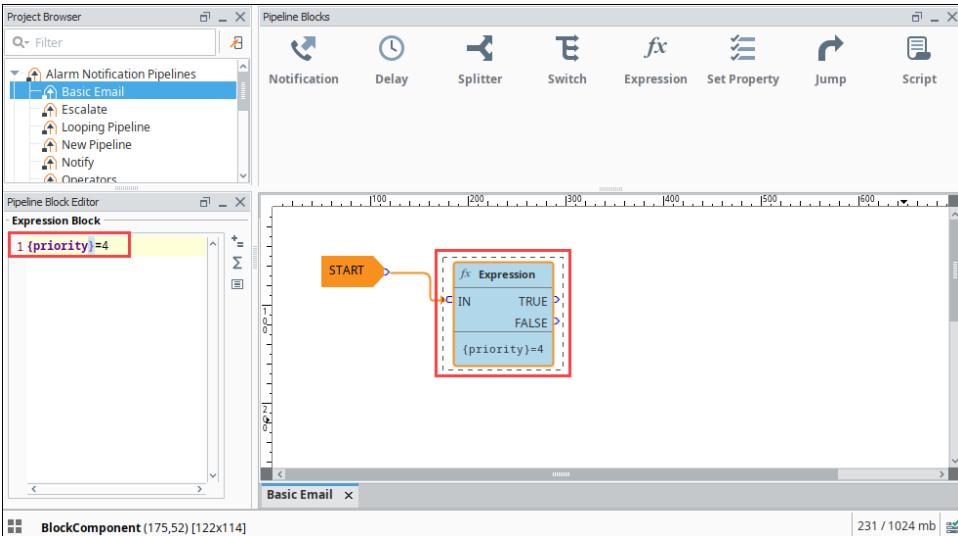
5. Alarm priorities have predefined integer values for filtering and sorting. Because this value is an int, you can test against it using =, <, >, >=, or <=. In this example, we are going to filter for all alarms with a priority of 'Critical.' **Critical** has a value of 4.

**Alarm Properties**

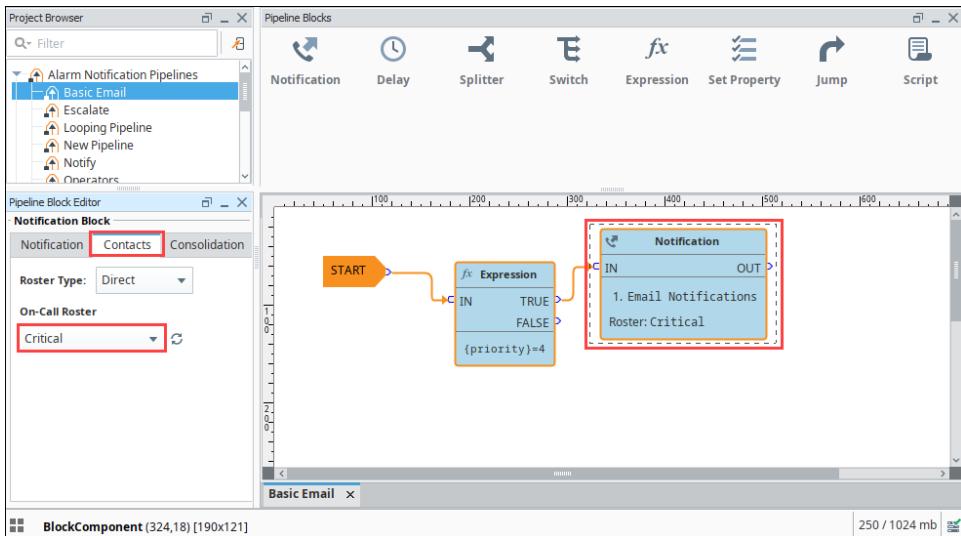
- 0 = Diagnostic
- 1 = Low
- 2 = Medium
- 3 = High
- 4 = Critical

Refer to [Alarm Event Properties Reference](#) for more information.

If the alarm priority is critical, the alarm will go to the output pin of the **True** value in the Expression block. If the priority is not critical, the alarm will go to the output pin of the **False** value. Notice, we are doing something different for each of these conditions.

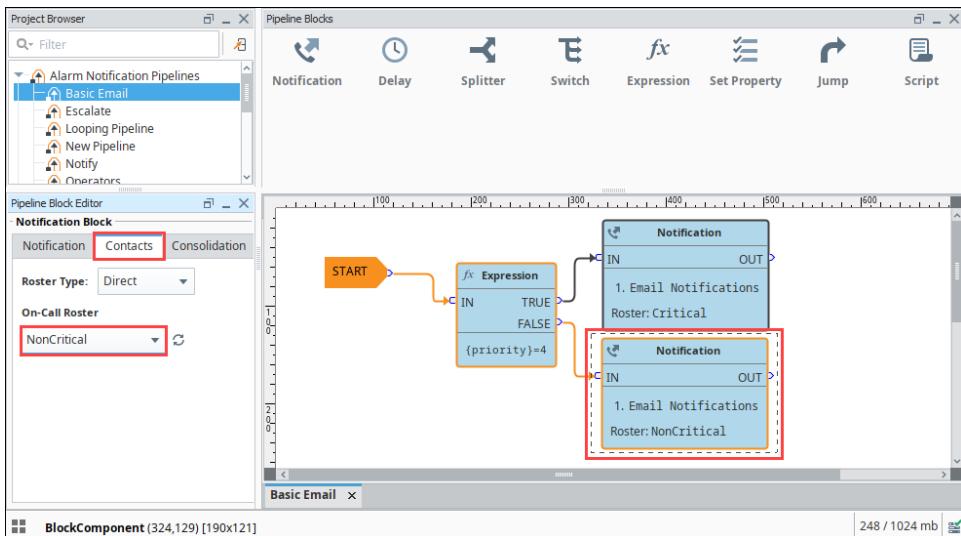


6. Drag in a Notification block, and connect the **True** output pin into the IN of the Notification block.  
 7. In the Pipeline Block Editor under the **Notification** tab, choose the notification type.  
 8. On the **Contacts** tab, under the **On-call Roster** dropdown, select the Critical on-call roster list of people you want to email.



- Drag in a second **Notification Block**, and connect the '**False**' output into the **IN** of the Notification block.

In the Pipeline Block Editor, under the Notifications tab, choose the **notification type**. In the Contacts tab, under the On-call Roster icon, select the **Noncritical** on-call roster. The Critical list is a different list of people from the Non Critical list.



As you see in this example, the alarm notification pipeline notified different lists of people based on the alarm's priority.

#### Related Topics ...

- [Pipeline - Filter on Alarm Associated Data](#)

# Pipeline - Filter on Alarm Associated Data

**Note:** The examples in this section assume you have a configured alarm, alarm associated data, a notification profile, and an existing on-call roster configured.

## How to Filter on Alarm Associated Data

Once associated data is added to an alarm, you can easily filter for associated data in an alarm pipeline. It's possible to add associated data that can be either static or dynamic. Below is an example of how to filter a notification pipeline based on associated data added to an alarm.

A WriteableFloat1 Tag is used for this example.



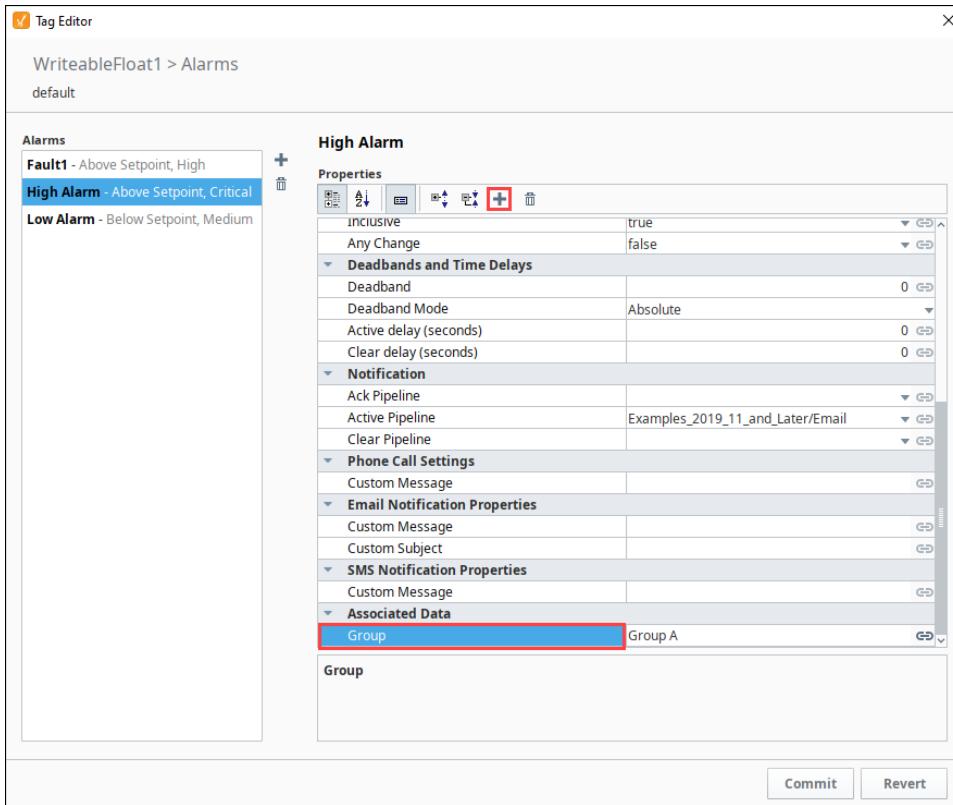
## Pipeline - Filter on Alarm Associated Data

[Watch the Video](#)

1. In the Tag Browser, double click on **WriteableFloat1**, the Tag Editor will open.
2. Scroll down to **Alarms**.
3. Click on the **Edit** icon to view the alarms. You'll notice this example has three alarms setup.

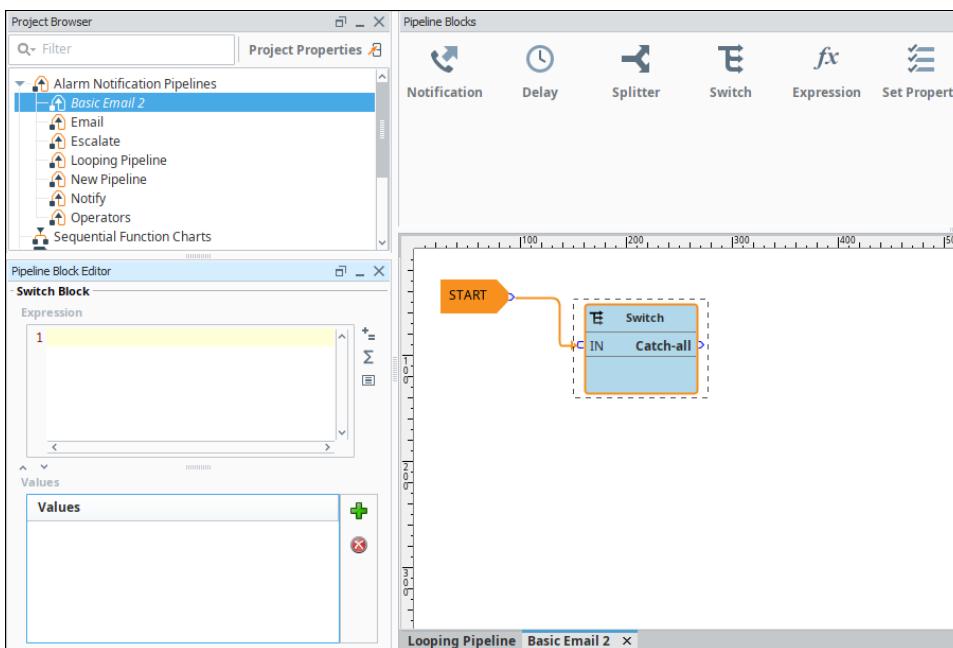
The screenshot shows the Tag Editor window for the 'WriteableFloat1 > Alarms' tag. On the left, there is a tree view under 'Alarms' with three entries: 'Fault1 - Above Setpoint, High', 'High Alarm - Above Setpoint, Critical' (which is selected), and 'Low Alarm - Below Setpoint, Medium'. The main pane displays the configuration for the selected 'High Alarm'. It includes sections for 'Properties' (with fields like 'Ack Notes Required' set to false and 'Shelving Allowed' set to true), 'Alarm Mode Settings' (Mode set to 'Above Setpoint'), 'Deadbands and Time Delays' (Deadband set to 0, Deadband Mode set to 'Absolute'), 'Notification' (Ack Pipeline set to 'Examples\_2019\_11\_and\_Later/Email'), and an 'Active Pipeline' section which states 'The pipeline that will be used to process active events generated by this alarm.' At the bottom right are 'Commit' and 'Revert' buttons.

4. You can see the High Alarm configuration has Associated Data called Group, and a value of either "Group A" or "Group B". We are going to use this associated data to filter the alarm notification pipeline.

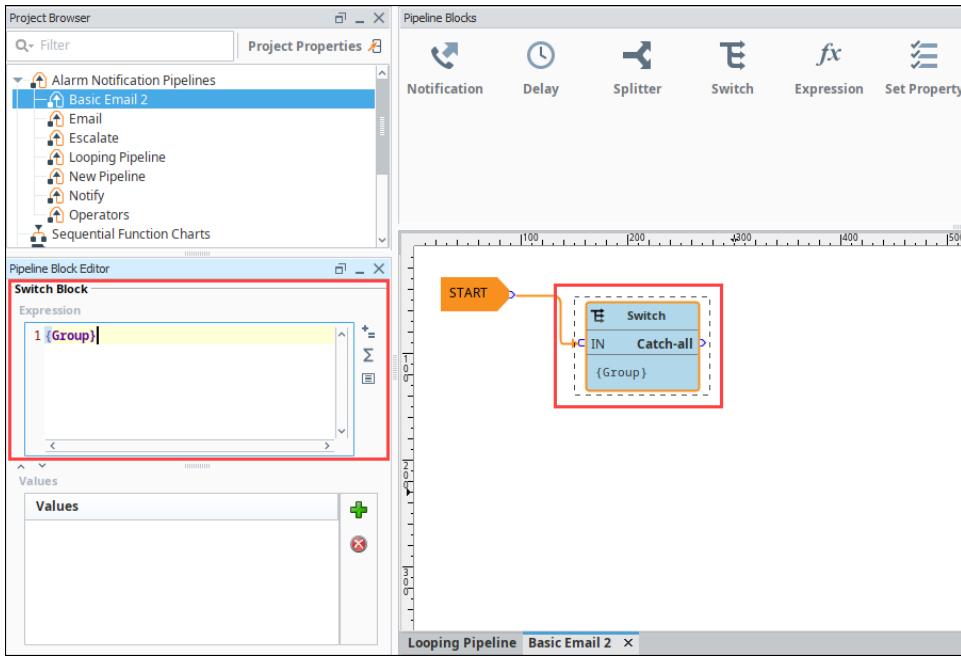


Let's create a pipeline that filters on associated data.

5. There are two blocks that can be used for filtering, either the Switch block or the Expression block. The Switch block allows you to switch on a value and do something different for Group A and Group B. The Expression block does the same thing, but only returns values of True or False.
6. For this example, drag in the **Switch block** to your pipeline, and connect the **Start block** to the **IN** of the Switch block.

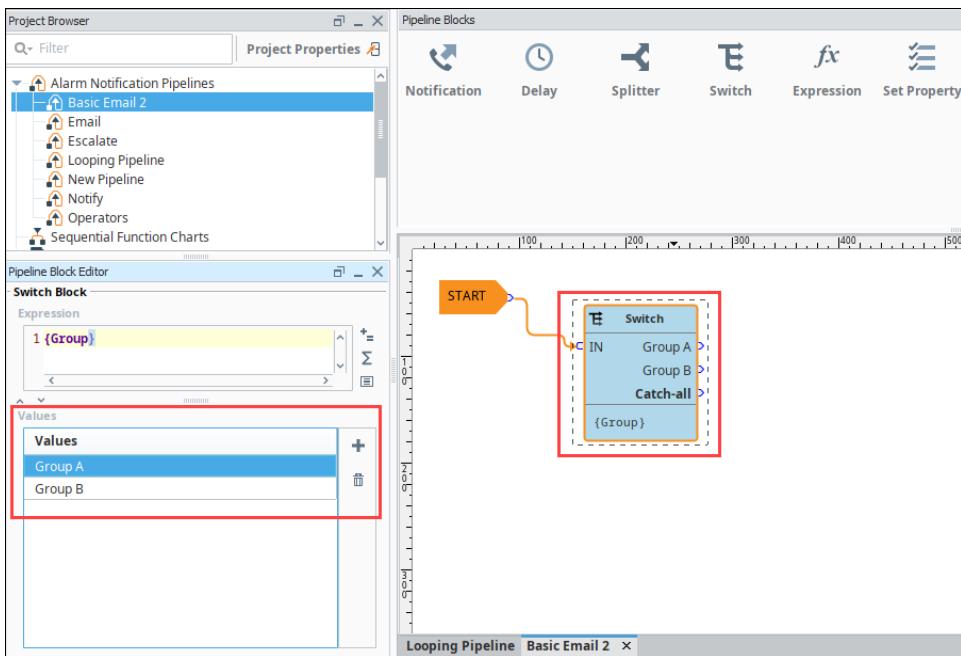


7. In the **Pipeline Property Editor**, you have to manually enter the expression because you will not find any of the associated data properties in the dropdown list. Enter the name of the associated data property in curly braces as follows, **{Group}**. The **Group** associated data property acts as a placeholder for the real values.



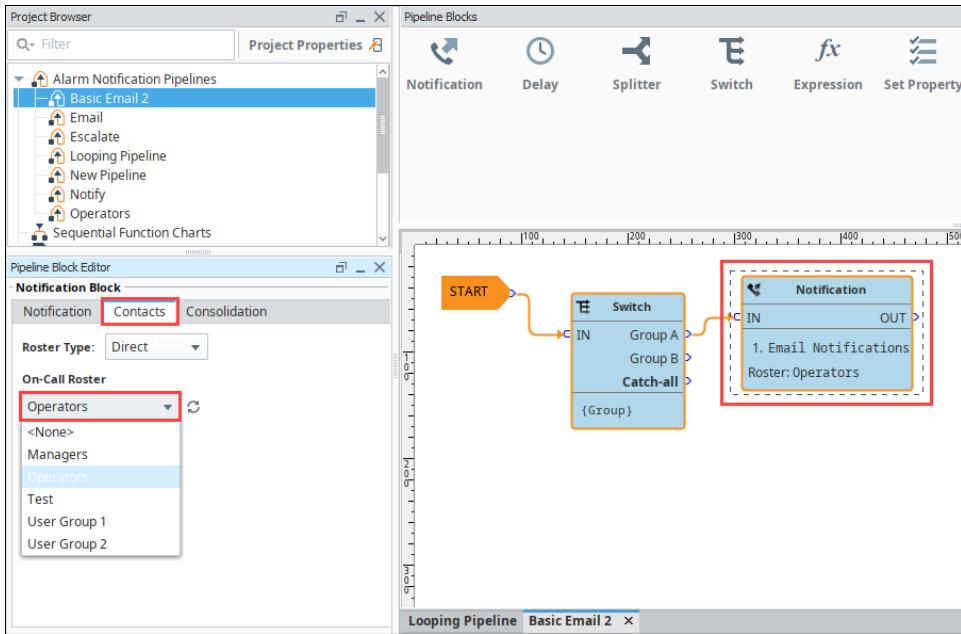
8. Next, you need to add some values to the expression. You can add as many values that you have values for. Click on the **Add** icon and add two values: **Group A** and **Group B**.

Once you enter both values, you will have outputs in the Switch block for **Group A**, **Group B**, and by default, **Catch-all**. So now you can notify a different list of people based on each Group.

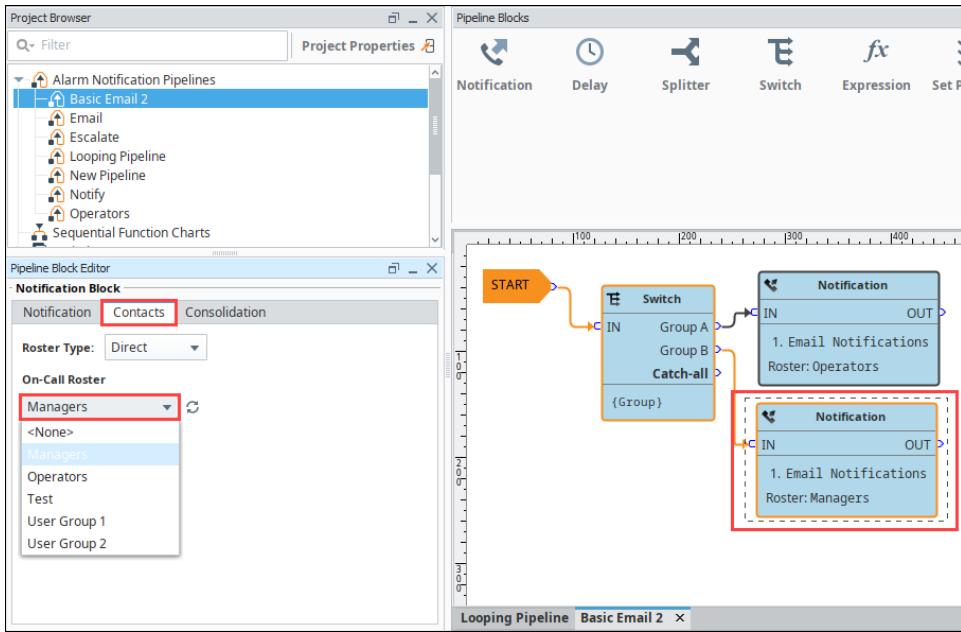


9. Drag a Notification block into your pipeline, and connect the output of **Group A** in the Switch block to the **IN** of the Notification block.

In the Pipeline Block Editor, under the Notification tab, choose **Email** as your notification type. In the **Contacts** tab, under the **On-call Roster icon**, select the roster you want to notify (i.e., Operators).



- Drag a second Notification block to your pipeline, and connect **Group B** from the Switch block to the **IN** on the second Notification block. Choose Email Notifications as your notification type, and specify a different On-call Roster to notify a different group of people (i.e., Managers).



Now, you are notifying people based on Group A (Operators) and Group B (Production Supervisors) by filtering on alarm associated data.

#### Related Topics ...

- [Pipeline - Escalation](#)

# Pipeline - Simple Loop

This section assumes that alarms are configured

To learn more, go to [Configuring Alarms](#), [Alarm Notification](#) and [On-Call Rosters](#).



This section assumes that alarms are configured

To learn more, go to [Configuring Alarms](#), [Alarm Notification](#) and [On-Call Rosters](#).

## On this page ...

- [How to Create a Looping Alarm Notification](#)

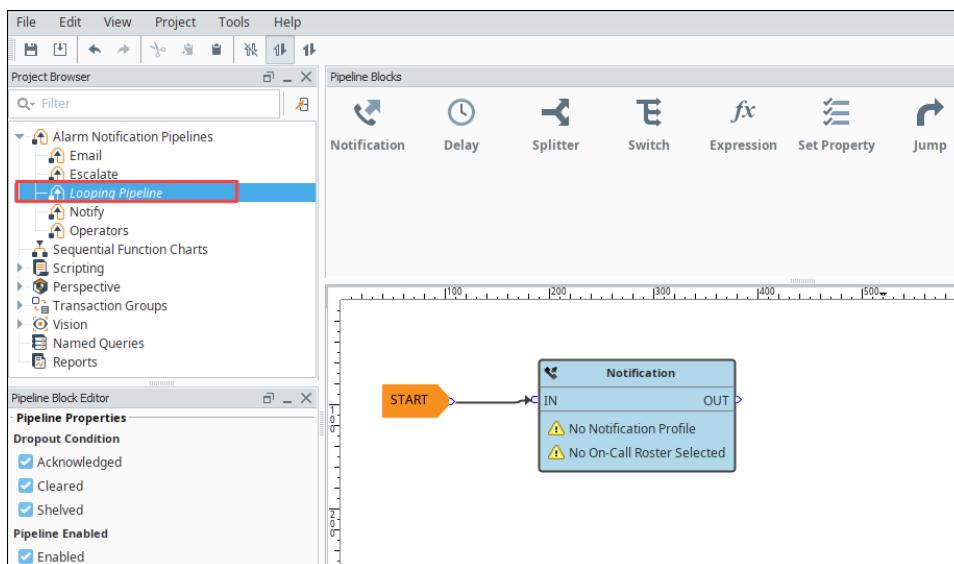
## How to Create a Looping Alarm Notification

You can create a loop in an alarm pipeline to notify users continuously until the alarm is dealt with. It is important to pay close attention to your dropout conditions when you are creating a loop. If you remove all dropout conditions the loop will continue until the alarm pipeline is manually stopped from the Gateway Webpage.

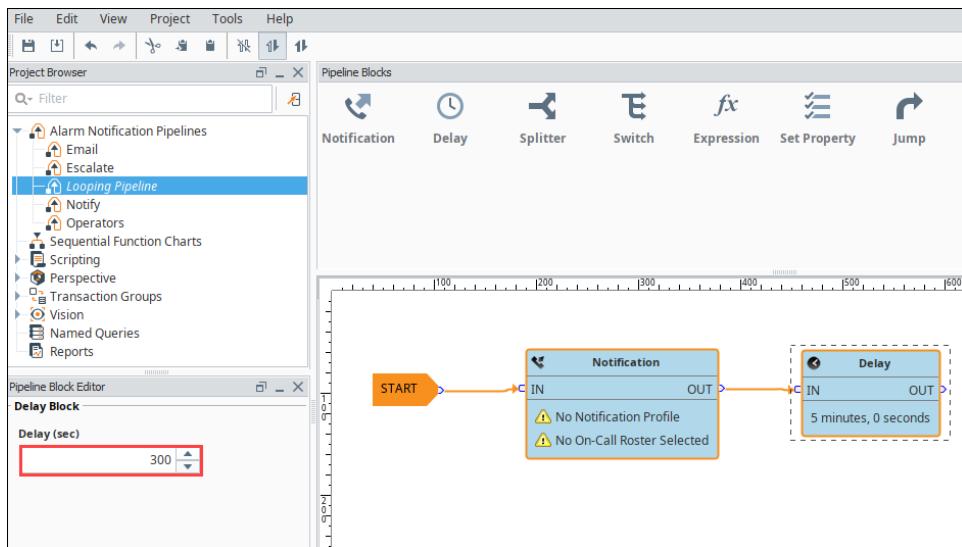
There are two [pipeline blocks](#) that we need to create a loop. The **Notification Block** to send a notification, and the **Delay Block** to create a pause between each notification.

In this example, we will use the default settings for the Dropout Conditions. All three options (Acknowledged, Cleared, and Shelved) will remain checked.

1. Drag in the **Notification Block** in to your pipeline, and connect the **Start** to the **IN** handle of the Notification block. You will need to set up your Notification block, but you can see more about that on the [Notification Block](#) page. This will cause the pipeline to notify immediately then move on.

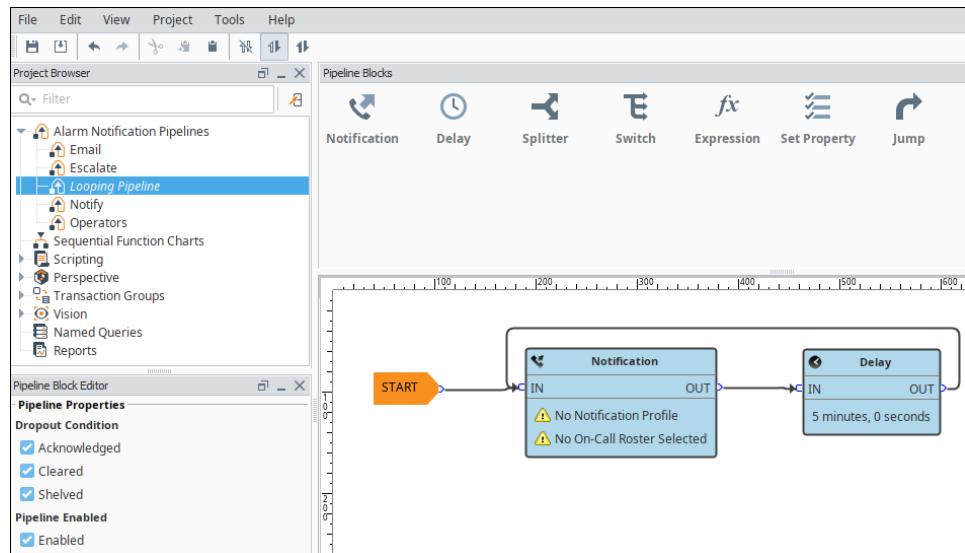


2. Drag a Delay block onto the pipeline and set the **Delay (sec)** property. We will chose 300 seconds (5 minutes).



3. Connect the two blocks by dragging from the **OUT** handle of the Notification block to the Delay block.

Now create a second connection by dragging from the **OUT** handle of the Delay block to the Notification block.



Now you have a pipeline that will notify immediately, wait 5 minutes, then notify again, and repeat until one of the dropout conditions is met.

You can use this technique with escalation to notify five times then change to another pipeline.

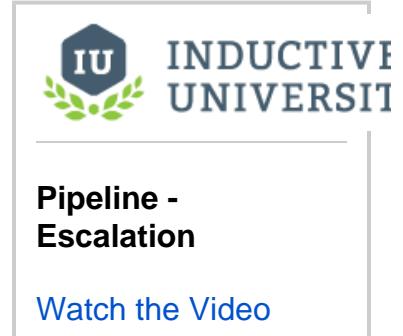
#### Related Topics ...

- [Pipeline - Escalation](#)

# Pipeline - Escalation

It is possible to set up escalation procedures in [alarm notification pipelines](#) in Ignition. The following example will create a pipeline that notifies operators three times. If a user does not acknowledge the alarm after the third time, the alarm escalates to the Production Supervisor's on-call roster.

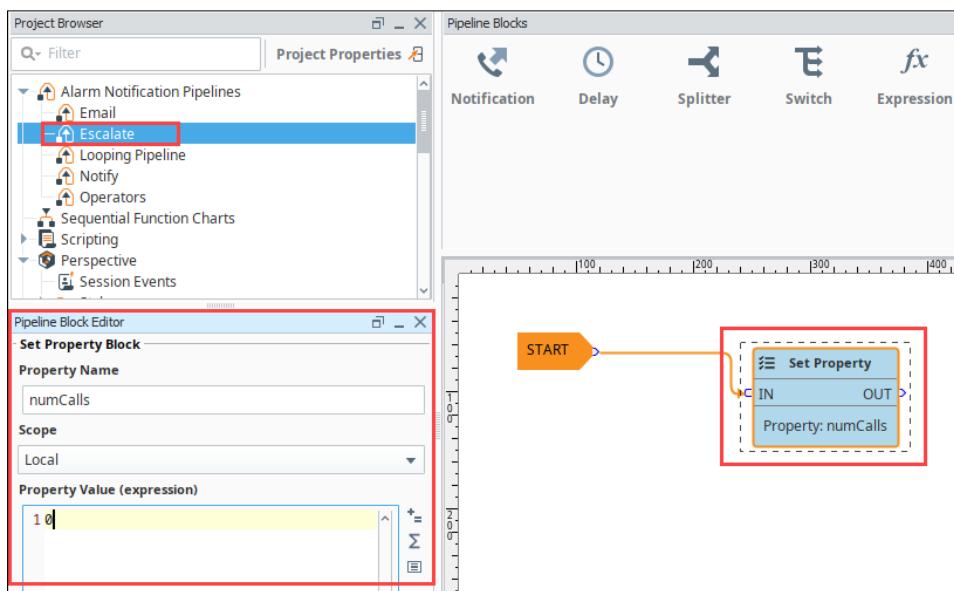
The following example requires that two separate [on-call rosters](#) have been configured ("Production Supervisors" and "Operators"), as well as an [email notification profile](#).



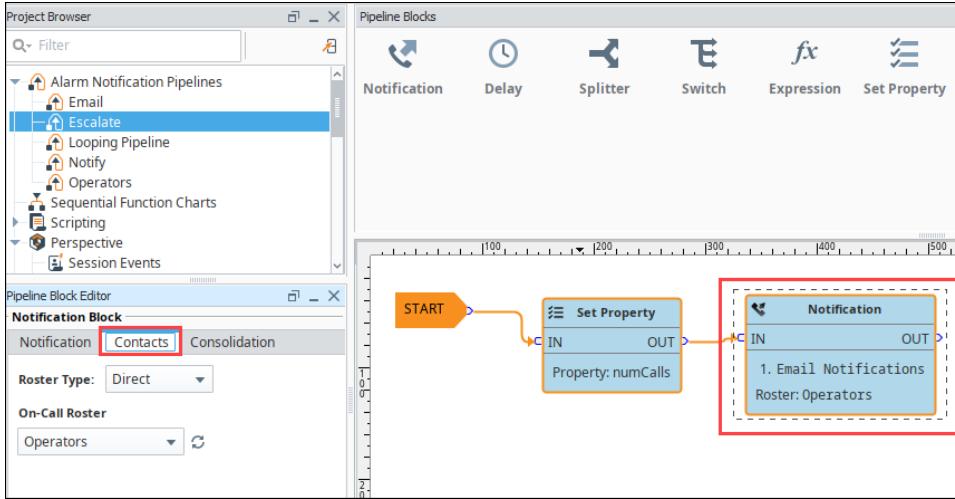
The image shows a screenshot of a web page titled "Pipeline - Escalation" from Inductive University. The page features a logo with the letters "IU" and a green laurel wreath. Below the title is a button labeled "Watch the Video".

## Set Up Escalation Procedures

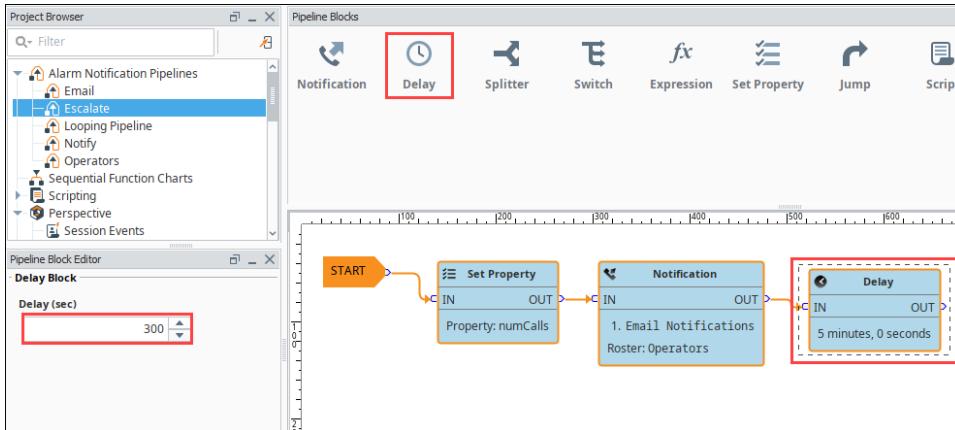
1. In the Project Browser under the Alarm Notification Pipelines, create a New Alarm Pipeline called **Escalate**.
2. In order to keep track of how many times the operators get notified, create a counter using the [Set Property block](#) inside your pipeline. Drag the Set Property block to the Pipeline workspace and connect the **START** block to the IN of the Set Property block.
3. In the Pipeline Block Editor, set the Property Name to **numCalls** and initialize the Property Value to "0".



4. Drag the Notification block to the Pipeline Workspace and connect the OUT from the Set Property block to the IN of the Notification block.
5. In the Pipeline Block Editor, set the Notification to use **Email Notifications** and set the Contacts to use the **Operators** on-call roster.



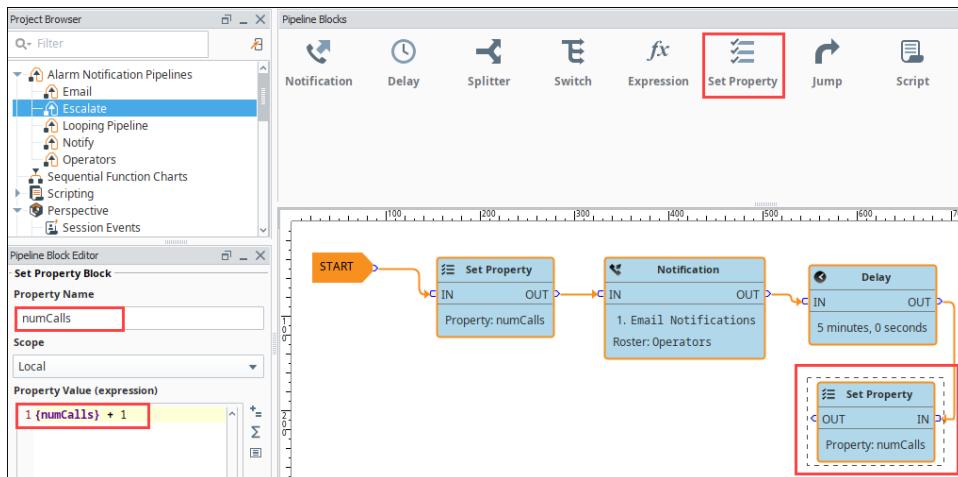
6. A Delay block will be added so the operators have some time to respond to the alarm before another notification is immediately sent out.  
Drag in the Delay block and connect the OUT from the Notification block to the IN of the Delay block.
7. In the Pipeline Block Editor, set the Delay property for **300 seconds**. It will give the operators 5 minutes to respond to the alarm before going to the next block.



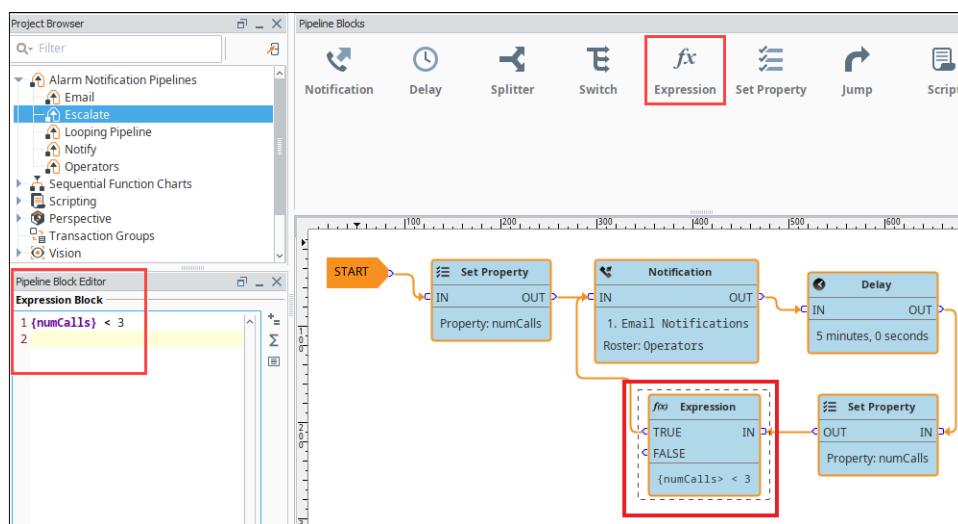
8. If the alarm is still active and not acknowledged, the counter will increment by 1. In order to increment the counter, drag in another Set Property block and connect the OUT of the Notification block to the IN of the Set Property block. You can right click on the Set Property block to **reverse the orientation**.

**Note:** The Set Property Block's **Property Value** uses Ignition's Expression language. More information on the Expression language can be found on the [Expression Overview and Syntax](#) page.

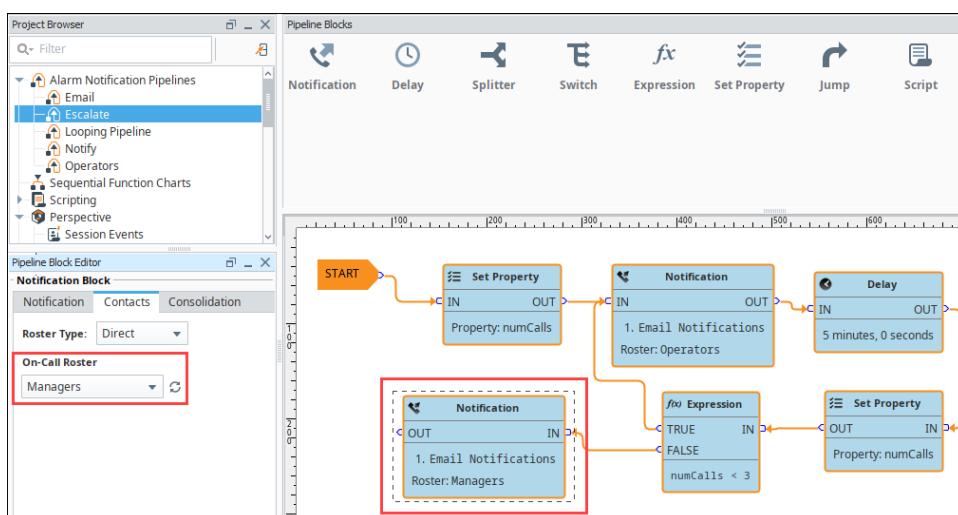
9. In the Pipeline Block Editor, set the Property Name to **numCalls**. In the Property Value Expression enter "**{numCalls} + 1**". In this expression, use the curly braces to refer to that variable so the counter gets incremented by 1.



10. The Expression block will check to see if **numCalls** is < 3. Drag in an Expression Block to your pipeline workspace and right click on the Expression block to reverse the orientation.
11. Connect the **OUT** of the Set Property block to the **IN** of the Expression block.  
Since the value of numCalls is less than 3, the alarm event will follow the True path. Connect the **True** output to the Operator Notification block.



12. If the **numCalls** is > 3, the alarm event will follow the False path and it will escalate to the Managers.
13. Drag in another Notification block and reverse the block orientation. In the Pipeline Block Editor, set the Notification to use **Email Notifications**, and set the Contacts to use the **Managers** on-call roster.
14. Connect the **False** pin to the **IN** of the Production Supervisors Notification block.



As you can see, when the Escalate Pipeline sets the numCalls variable to a value of "0", it's going to notify the Operators on-call roster through email that the alarm is active. It will wait 5 minutes, and if the alarm is still active, it will increment the counter by 1. This will repeat until the numCalls is > 3. After the third time, if the alarm is still active and in the pipeline, then the Production Supervisors will be notified. Keep in mind, that if the alarm at any point meets the dropout conditions, it will not go to the next block of the pipeline.

**Note:** You can also use the [Jump Block](#) as your escalation instead of a second Notification block. This will allow you to jump into another complete pipeline when nobody answers.

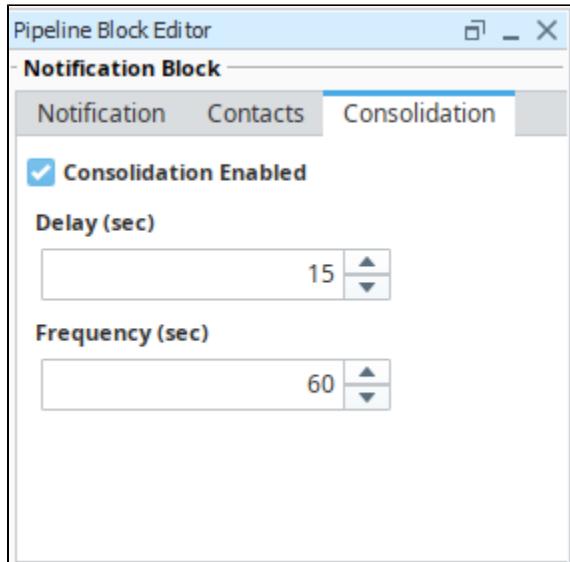
#### Related Topics ...

- [Pipeline - Notification Block Consolidation](#)

# Pipeline - Notification Block Consolidation

## How Consolidation Works

**Notification consolidation** allows you to limit the number of notifications sent by specifying a delay during which incoming events will be collected. When the delay expires, all events that have arrived during the period of time will be sent together to the notification profile.



## Pipeline - Notification Block Consolidation

[Watch the Video](#)

## Example

Once an alarm enters the Notification block in this pipeline, it will wait for **Delay** number of seconds (in this case 15 seconds) before sending the alarm. If additional alarms enter this notification block, it will send using the **Consolidated Message/Subject** from the **Notification** tab depending on your notification type.

Once an alarm has been sent, whether it was a consolidated notification or not, this Notification Block will wait for **Frequency** number of seconds (in this case 60 seconds) before it can send another email.

Note that Consolidation only effects this pipeline. Any notification blocks in other pipelines will not be effected.

Related Topics ...

- [Pipeline Status](#)

# Pipeline Status

## Monitoring the Pipeline Status

It's possible to monitor the status of your alarm notification pipelines to see exactly where your alarms are in the notification process in Ignition. You can do this from the Gateway Webpage.

1. Go to the **Status** tab of your Gateway Webpage and on the left side of the navigation bar, click on **Systems > Alarm Pipelines**. The Alarm Pipeline page will open and display the status of all your Alarm Pipelines. This example shows five pipelines with one active pipeline for Basic Email and four inactive pipelines.

Name	Active?	Items
Basic Email	true	2
Escalate	false	0
Escalation	false	0
Loop	false	0
Notify	false	0

2. To see a detailed status of any of your alarm pipelines, click the **Details** tab for any of your alarms. This example shows that the Basic Email pipeline has two active alarms. The Details shows you the affected Source Path, Display Path, Pipeline Block, Status and the length of Time stuck in a pipeline block. You can **Cancel** the alarm to delete it from the pipeline, and view the logs by clicking on the **Pipeline Logs** tab.

Source	Display Path	Block	Status	Time In Block
provide:default:/tag/gensim/Writeable/WriteableFloat1/!almFault1		NotificationBlock	Notifying user 'admin'	25 minutes
provide:default:/tag/gensim/Writeable/WriteableFloat1/!almHighAlarm	Machine A	NotificationBlock	Notifying user 'admin'	25 minutes (1 of 1)

How long an alarm stays in the in the Alarm Pipeline Status depends on how the pipeline is configured, the type of notification (i.e., Email, SMS or Voice), and what the pipeline is doing (i.e., notifying users, looping, caught in a delay, executing a script, etc.,).

**Pipeline Status**

[Watch the Video](#)

# Adding Pipelines to Tags

Any alarm in Ignition can use an existing alarm notification pipeline on the local Gateway and/or [remote Gateway](#). Alarms can share pipelines resulting in a single pipeline providing notification services to many alarms. When an alarm becomes active, cleared, or acknowledged it can execute a designated alarm pipeline. The information about the alarm is ported automatically into the alarm pipeline.

## Different Pipelines for Different Events

Each alarm has 3 events that can push it into a pipeline: Active, Clear, and Acknowledge (Ack). While they all work the same way, it is helpful to know a few things about each event. For all pipelines, the default settings are to drop alarms from the pipeline if that alarm is Acknowledged, Cleared, or Shelved. This means each Alarm Pipeline Event requires slight changes to these properties, so it is a good idea to have special "cleared" or "shelved" versions of any pipelines that will be called from these other events.

### Active Pipeline

The Active Pipeline event is the most commonly used event for sending alarm notification. This happens when the alarm goes into the active state (alarm has happened). The default settings are commonly OK because any Acknowledged, Cleared, or Shelved alarms are usually not considered active anymore.

### Clear Pipeline

The Clear Pipeline event is the most commonly used event for sending notification that the issue is no longer active, but may still need attention. This happens when the alarm goes from the active state to the cleared state. The default setting to **drop out if "Cleared" is NOT OK** because any alarm event that started as a "Clear" event will always drop out at the Start Block.

### Ack Pipeline

The Acknowledge (Ack) Pipeline event is the most commonly used event for telling your users that someone is working on the problem. This happens when the alarm goes into the acknowledged state (usually an operator pressing the Acknowledge button). The default setting to **drop out if "Acknowledged" is NOT OK** because any alarm event that started as an "Acknowledged" event will always drop out at the Start Block. It is usually a good idea to also set the "Cleared" dropout condition to False since any acknowledge notification is probably wanted regardless of if the alarm is cleared.

## Custom Message Scripts

When adding a pipeline to an alarm, you can also set up custom messages that will be used in each type of notification. These custom messages will only be used for this particular alarm, and will overwrite the settings configured for the message in the pipeline.

### Email

Email Notification is unique in that not only can you specify a custom message, but also a custom subject for the email. These will only be used for the alarm they are configured on.

#### Custom Message Script

```
The "{name}" alarm became {eventState} at {eventTime|hh:mm:ss} with a value of "{Value}"
```

### SMS

The SMS Notification has a property that allows you to create a custom text that will get sent out when this alarm is triggered.

### Voice

The Voice Notification system allows you to create a custom message on alarms as well. The custom message will only replace the Active Message portion of the voice scripts, and will play the defined script for all other prompts.

## Associate a Pipeline with the Alarm

1. Double-click on a Tag that already has an alarm configured (i.e., WriteableFloat1). The **Tag Editor** is displayed and you can access its properties.

## On this page ...

- [Different Pipelines for Different Events](#)
  - [Active Pipeline](#)
  - [Clear Pipeline](#)
  - [Ack Pipeline](#)
- [Custom Message Scripts](#)
  - [Email](#)
  - [SMS](#)
  - [Voice](#)
- [Associate a Pipeline with the Alarm](#)

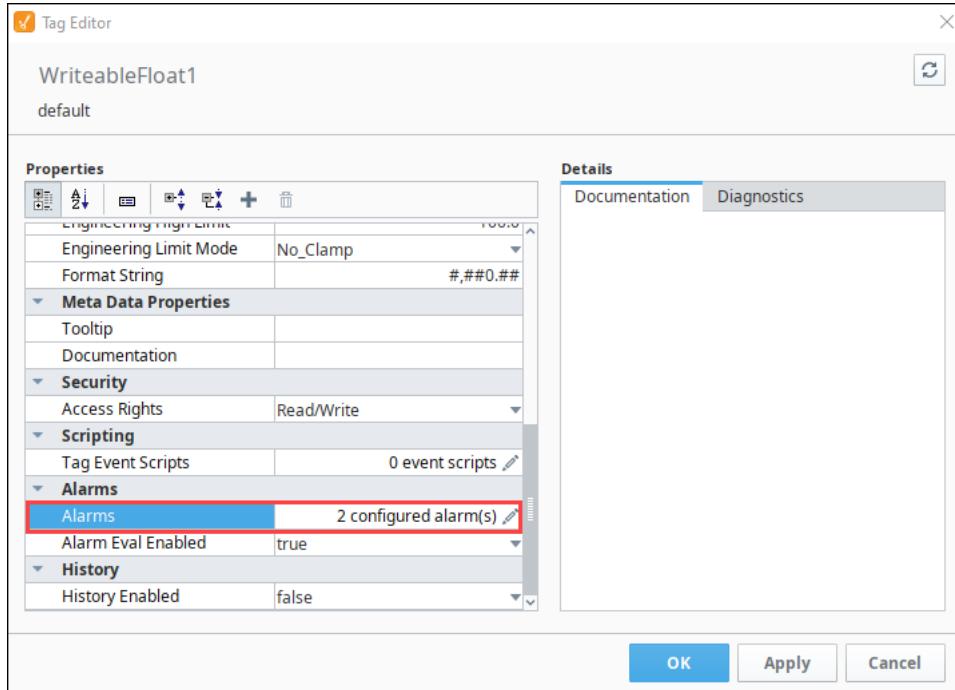


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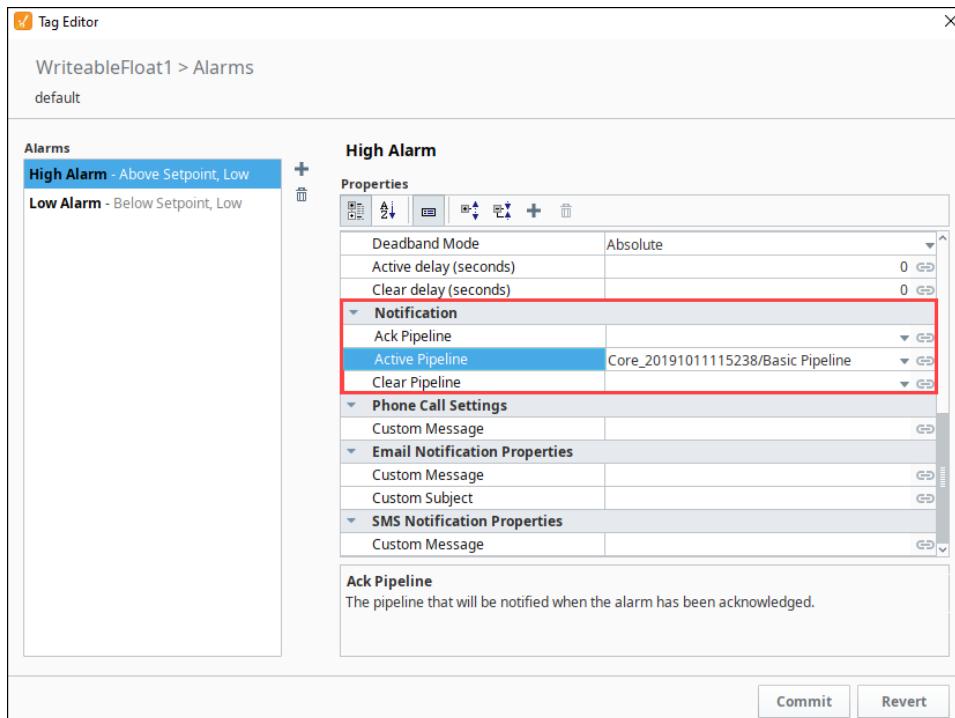
## Adding Pipelines to Tags

[Watch the Video](#)

2. Scroll down to the Alarms section and select an alarm. (If you don't have an alarm configured, create one. To learn more about creating alarms, go to [Configuring Alarms](#).)



3. Click on the Edit icon to edit the alarms.
4. Select the alarm to edit then scroll down to the **Notification** section.
5. Select the desired alarm pipeline from the dropdown for any of the alarm status states. Typically, operators want to know when an alarm goes active. This example uses the Basic Pipeline when the alarm status becomes Active.
6. Click **Commit**.



Now, every time a the High Alarm Tag goes Active, it will use the logic in the Basic Email pipeline to notify the operators.

Related Topics ...

- [Pipeline Blocks](#)

# Enterprise Administration

## Overview

The Enterprise Administration Module (EAM) enables you to control and monitor any number of Ignition Gateways from a central Gateway. The EAM takes advantage of the Gateway Network system to seamlessly deliver data between Gateways.

EAM works well in distributed systems and systems with [multiple Gateways](#). EAM is not required for large Ignition systems, but there are several benefits to incorporating the module:

- **Gateway Version Control** - Upgrades modules on each controller and agent Gateway to ensure each installation is on the same version.
- **Project Synchronization** - In cases where the same project is used on multiple Gateways, projects can automatically be pushed to select agents. This simplifies how updates are pushed out and eliminates the need to update each project individually.
- **Monitor Agent Health** - The controller Gateway monitors Agent health and will trigger alarms when an issue arises. Alarm notifications can also be sent, so you will always know immediately when an issue is detected.
- **Quick Recovery from System Failures** - Hardware failure can cause days of downtime. Agent recovery allows for quick Gateway, license, and module restoration on new hardware to greatly reduce the amount of time the system is down.

## On this page ...

- Overview
- Agents and Controllers
- Task Management
  - On-Demand or Scheduled
- Disaster Recovery and Prevention



## Introduction to Enterprise Administration Module

[Watch the Video](#)

## Agents and Controllers

EAM involves coordinating several different Gateways on the same network. Each Gateway is assigned a role of Controller or Agent:

- **Controller** - Manages or controls other connected Gateways. The Controller is responsible for assigning tasks as well as monitoring each agent. Only a single Gateway on each Gateway network can be a controller.
- **Agent** - Gateway that performs all assigned tasks and reports to the Controller. Multiple Agents can report to one Controller.

## Task Management

EAM allows you to schedule common Gateway tasks to execute against remote Agent Gateways. Tasks are requests sent to an Agent by the Controller. These requests cause the Agent to perform some action such as activating a license. Tasks include:

- Activate License
- Collect Backup
- Install Modules
- Remote Agent Upgrade
- Restart Agent
- Restore Backup
- Send Project
- Send Project Resources
- Send Tags
- Unactivate License
- Update License

#### **Activate License**

Activate a license key on selected agent Gateways.

#### **Collect Backup**

Collect a Gateway backup from an agent machine.

#### **Install Modules**

Install one or more modules on selected agent Gateways.

#### **Restart agent**

Restarts the Ignition service on the agent machine.

#### **Restore Backup**

Restore a Gateway backup on selected agent Gateways.

#### **Send Project**

Distributes a project to remote servers. Replaces the project on the remote server as if an export/import was performed.

#### **Send Project Resources**

Distributes project resources, like windows and templates, to remote servers.

#### **Unactivate License**

Unactivate a license key on selected agent Gateways.

#### **Update License**

Update the license on selected agent Gateways.

## **On-Demand or Scheduled**

Gateway tasks can be executed immediately, scheduled to run once at a later time, or set up as part of a recurring schedule. The schedules can be freely modified or [paused](#). Scheduled tasks can also [execute on-demand](#), allowing the tasks to be called at will.

## Agent Tasks

Available Tasks	Running and Scheduled Tasks	Task History			
Name	Repeats?	Next Scheduled	Current State	Targets	
Collect Backup	true	11/2/16 2:00:00 AM	Scheduled	Agents [Agent99]	<a href="#">More</a> <a href="#">edit</a>
Send Project	false	11/4/16 2:00:00 AM	Scheduled	Agents [Agent99]	<a href="#">More</a> <a href="#">edit</a>
Send Project Resources	false	11/4/16 3:30:00 AM	Scheduled	Agents [Agent99]	<a href="#">More</a> <a href="#">edit</a>

→ [Create new Gateway Task...](#)

## Disaster Recovery and Prevention

Every EAM Agent sends information to the controller about its general health status. Whenever problems occur on an Agent, the controller is notified of the Agent's status in the form of Agent Events. Problems could include:

- High CPU usage on the Agent
- Large numbers of system errors in a short timeframe
- Unusually high usage of database connections

Loss of connectivity to the Agent also triggers an Agent Event on the controller. Agent Events are recorded in an external database for analysis and reporting later. Agent Events can also be directly configured on the controller to automatically trigger alarms or send [alarm notifications](#).

Active Time	Display Path	Current State	Priority
6/29/16 3:55 PM	Site A/cpu [ERROR]	Cleared, Unackno...	High
6/29/16 3:55 PM	Site A/cpu [ERROR]	Cleared, Unackno...	High
6/29/16 3:55 PM	Site A/cpu [WARNING]	Cleared, Unackno...	Low
Details	Notes	Site A/cpu [WARNING]	Cleared, Unackno...

**Config Properties**

Source Path	sys:Site A:/prov:EAM:/alm:cpu-error
Display Path	Site A/cpu [ERROR]
Name	cpu-error
Mode	Any Change

[Acknowledge](#) [Shelve](#)

The [Collect Backup](#) Gateway task does more than simply collect a Gateway backup from Agents. Whenever the task runs, the Gateway backup, all installed modules, and the current license are collected from the Agent and stored in the archive system on the controller. This system allows for quick recovery later if an Agent machine catastrophically fails and must be reinstalled.

[In This Section ...](#)

# Creating a Controller

To set up the EAM, you must first designate one machine as the controller. Keep track of the IP address of this machine because you must enter this IP address on each agent during agent installation.

Install the EAM module in the Gateway if it has not already been installed. After module installation, you must designate a database connection that will be used by the controller to store agent event history. Navigate to **Config > Databases > Connections**, and set up a connection to the database that you intend to use.



## Tips for Configuring Controllers and Agents

- If you have any existing installations of Ignition running, it's a good idea to perform a backup before you begin this process.
- If you have two or more Gateway Webpages open in your browser, you may want to have the Controller and Agents on separate monitors so you don't get confused which one you are working on.
- It's always a good idea to verify that all your modules are loaded correctly. Go to **Config > Modules** to check which modules you have installed.

## On this page ...

- [Set Up a Controller](#)
- [Remove a Controller](#)



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## Creating a Controller

[Watch the Video](#)

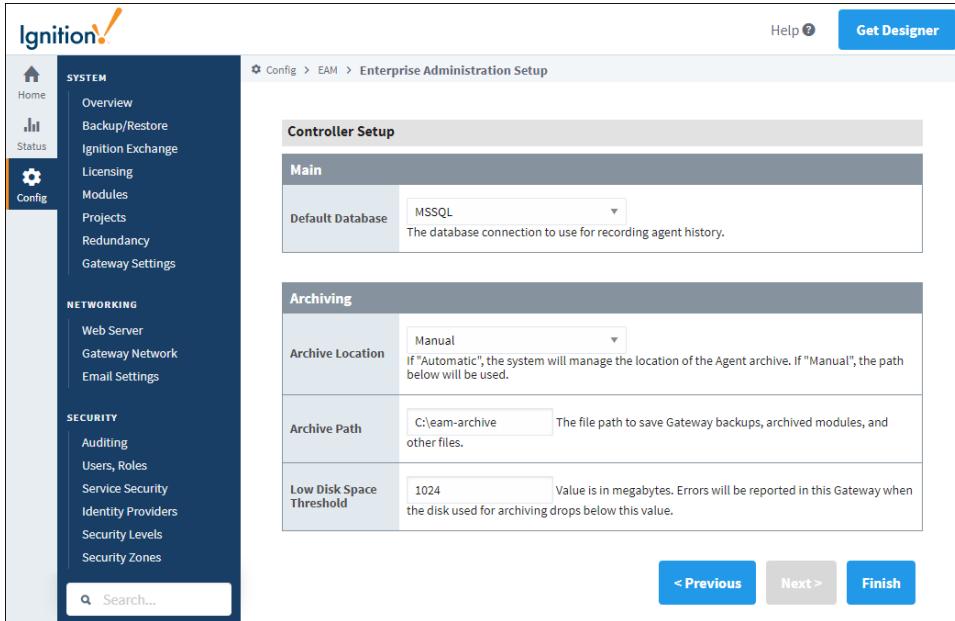
## Set Up a Controller

1. Navigate to **Config > Enterprise Administration > Setup**. You will now enter the EAM Setup Wizard.
2. Since you are installing the controller, select **Controller** on this screen. Click **Next**.

The screenshot shows the Ignition EAM Setup Wizard. On the left is a dark sidebar with navigation links for Home, Status, and Config (which is selected). The main area has a breadcrumb trail: Config > EAM > Enterprise Administration Setup. A sub-header says 'Select Controller or Agent'. There are two radio buttons: 'Agent' (disabled) and 'Controller' (selected). Below the radio buttons is a description: 'Installs the module as a controller. A controller Gateway can control remote agent Gateways.' At the bottom are 'Next >' and 'Finish' buttons, with 'Previous' being grayed out. The 'Controller' option is highlighted with a red box.

3. Next you need to setup the controller.

- a. **Default Database** - For the default database, you must select the database connection that you created before entering the EAM Setup Wizard. If you forgot to create the database connection, you can do so now and return to the EAM Setup Wizard later.
- b. **Archive Path** - This is a file path on the Gateway's local machine where all archived files will be stored. You can use a locally mounted network share for archiving. Use a value such as **E:\eam-archive**. It is strongly recommended that you put a system into place to externally monitor the free size of the disk that contains the archive. Gateway backups can potentially be many megabytes in size, and can eat up large volumes of space when using many agents.



4. After you have determined your settings, click the **Finish** button to save the controller settings and exit the wizard. This machine is now ready to accept agents.
5. Once you set up your Controller, the **Setup** option disappears in the menu and is replaced with a list of Enterprise Administration menu options.

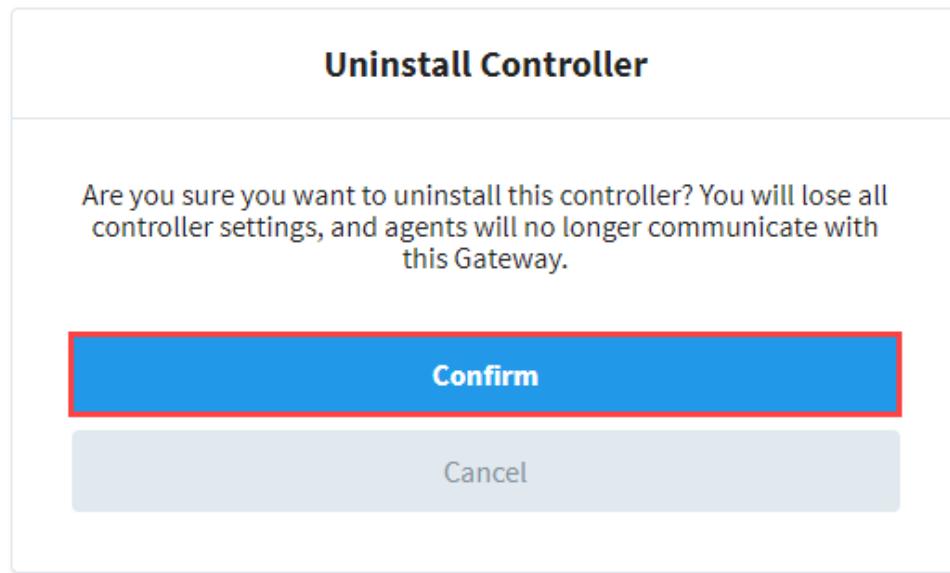


## Remove a Controller

1. To remove a Controller, from the Gateway, go to **Config** section
2. Scroll down and select **Enterprise Administration > Controller Settings**.
3. Click the **Uninstall Controller** link.

The screenshot shows the Ignition Config interface. The left sidebar has sections for Home, Status, and Config (which is selected). Under Config, there are categories like SYSTEM, NETWORKING, SECURITY, and DATABASES. The SYSTEM category is expanded, showing Overview, Backup/Restore, Ignition Exchange, Licensing, Modules, Projects, Redundancy, and Gateway Settings. The main content area is titled 'Controller Settings'. A red box highlights the 'Uninstall Controller' link under the 'Main' section. The 'Main' section also includes a 'Default Database' dropdown set to 'MSSQL'. The 'Archiving' section contains settings for 'Archive Location' (set to 'Manual'), 'Archive Path' (set to 'C:\eam-archive'), and 'Low Disk Space Threshold' (set to '1024'). A 'Save' button is located at the bottom right of the form.

4. A confirmation window will appear. Click **Confirm** to complete uninstalling the controller.



#### Related Topics ...

- [Adding an Agent](#)
- [Event Threshold Settings](#)

# Adding an Agent

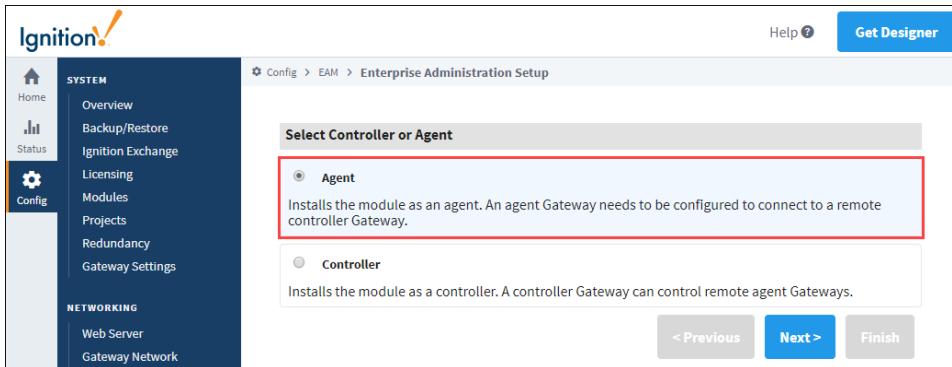
## Agent Setup

To communicate with the controller, agents send data across a Gateway Network connection. If your Gateway Network setup requires that connections be manually approved in advance on the controller Gateway, you will need to [set up the Gateway Network connection](#) before starting the EAM Setup Wizard. You will be able to select the existing Gateway Network connection within the wizard. Navigate to **Config > Enterprise Administration > Setup** to begin the EAM Setup Wizard.

## On this page ...

- [Agent Setup](#)
- [Agent Post Setup](#)
- [Agent Approval](#)
- [Delete an Agent](#)
- [Modifying Agent Settings](#)

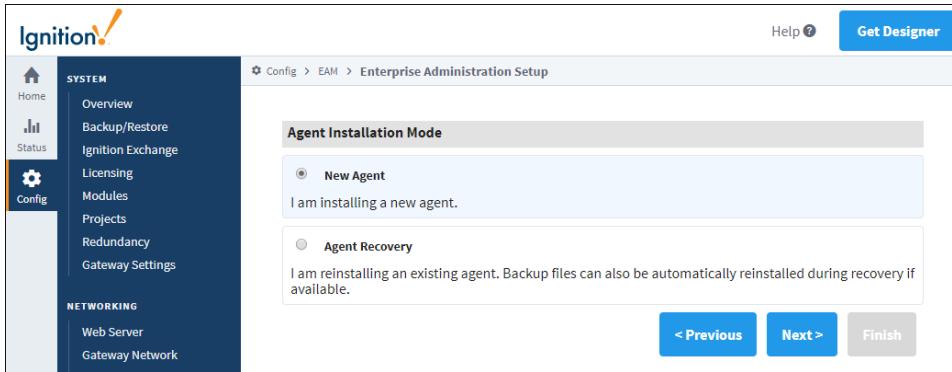
1. Since you are installing an agent, select **Agent** on this screen. Click the **Next** button.



2. Select New Agent or Agent Recovery.

- a. Select **New Agent** if you are setting up a machine that is unknown to the controller.
- b. Select **Agent Recovery** if you are reinstalling an existing agent (possibly on a different machine), and the machine has been known to the controller in the past. This option also gives an opportunity to perform a system recovery (restore Gateway backup, reinstall missing modules and license) if possible.

3. After you made your selection, click the **Next** button.



4. As mentioned previously, a Gateway Network connection is required to communicate with a controller. On this page, you can either select an existing connection from the dropdown list, or click **Create New Connection** to create a new Gateway Network connection. If you are using an existing connection, enter the **System Name** that identifies your Agent to the controller.
5. Click **Finish**.

**Agent Settings**

If you don't see your EAM controller in the list below, you must configure a Gateway Network connection to the controller before entering the Setup Wizard. Click [here](#) to visit the Gateway Network configuration page.

Agent Settings	
Controller	Controller The Gateway Network server running the EAM controller
System Name	Ignition-TR-89MC8R2-W5 The system name uniquely identifies this agent to the controller and other agents. Note that this setting also changes the system name under general Gateway Settings.

[\*\*< Previous\*\*](#) [\*\*Next >\*\*](#) [\*\*Finish\*\*](#)

## Agent Post Setup

The EAM module will now attempt to register the local Gateway as an EAM agent on the controller, and download files if performing a system recovery.

- If you are running in **New Agent mode**, you will see the agent status check on the screen. When the agent status check is complete, you will need to navigate to the controller Gateway and approve the agent on the Gateway Agents page, as discussed in the section below. Click the **Retry** button to recheck agent status on the controller if the first status check failed.

Config > EAM > Enterprise Administration Setup

**Agent Post Setup Items**

✓ Setup is complete. This agent is now connected to the controller.

Checking agent status on controller.... **done**

- If you are running in **Agent Recovery mode**, and you selected the **System Recovery** option, you will see the download status of the license file, installed modules, and the most recently collected Gateway backup file. Depending on the contents of your archive, some files may not be available. Click the **Apply Files** button to apply downloaded files. Note that this operation will require a Gateway restart if a Gateway backup file needs to be applied. Click the **Ignore Files** button to close this page and not apply downloaded files. Note that the agent settings have already been saved, so it is safe to not apply downloaded files if you choose. Click the **Retry** button to attempt to download the recovery files again.

**Caution:** After you set up your agents, it is very strongly recommended that you set up a regularly scheduled Collect Backup task for your agents. System recovery through the EAM Setup Wizard will not work if there are no archived backup files! To learn more about performing agent backups, refer to [Agent Task - Backup and Restore](#).

## Agent Approval

When an unknown agent first contacts the controller, it is saved in pending status. No interaction with the controller is allowed until you approve the agent. Agent version and license information fields will remain empty until the agent is approved.

- To approve the agent, go to your controller on the **Config** section of the Gateway Webpage.
- Scroll down to **Enterprise Administration > Agent Management**.
- Click **approve** the right side next to the name of your agent. After a few moments, the agent's status should change to **Connected**.

Agent Management					
Gateway	Status	Group	Version	License	Last comm
Agent133	Pending	Default Group		N/A	<a href="#">approve</a> <a href="#">delete</a>
Ignition-ubuntu	Disconnected	Default Group		10/12/16 3:22:00 PM	<a href="#">More</a> <a href="#">delete</a>
<a href="#">Edit agent groups...</a>					

## Delete an Agent

1. To remove an agent, go to your controller on the **Config** section of the Gateway Webpage.
2. Click the **delete** button on the right side.

Agent Management					
Gateway	Status	Group	Version	License	Last comm
Agent133	Pending	Default Group		N/A	<a href="#">approve</a> <a href="#">delete</a>
Ignition-ubuntu	Disconnected	Default Group		10/12/16 3:22:00 PM	<a href="#">More</a> <a href="#">delete</a>
<a href="#">Edit agent groups...</a>					

If the agent machine is still active, the agent will reappear on the list in pending status, but will no longer be able to interact with the controller.

To remove the agent permanently, you must navigate to the agent Gateway and uninstall the agent via the [Agent Settings](#) page.

## Modifying Agent Settings

You can modify Agent Settings by going to the agent, and under the **Config** section on the Gateway Webpage, select **Enterprise Administration > Agent Settings**. Here you can change the Gateway Network Server name and the Send Stats Interval.

- Gateway Network Server is the Gateway Network Server running the EAM controller. You can select your controller machine from this dropdown list.
- Send Stats Interval is the interval in seconds that the agent will send its statistics to the controller Gateway.
- After you make your changes, click **Save**.

Agent Settings	
<a href="#">Uninstall Agent</a>	
<b>Main</b>	
Gateway Network Server	<input type="button" value="Controller"/> The name of the Gateway Network server that holds a connection to the controller Gateway.
Send Stats Interval	<input type="text" value="5"/> The interval in seconds that the agent will send its statistics to the controller Gateway.
<b>Save</b>	

- **Perform System Recovery** - This checkbox is only shown when running in Agent Recovery mode.
- After you make your selections, click the **Finish** button. The Gateway will attempt to download the most recent Gateway backup, previously installed modules, and the license file.

**Related Topics ...**

- [Agent Recovery](#)
- [License Management](#)
- [Agent Task - Scheduling](#)

# Agent Tasks

## Using the Gateway Network

Once the Gateway Network is up, and there is at least one Controller and one Agent configured, there are a variety of actions that can be performed on your agents in the form of Agent Tasks.

Agent Tasks involve performing a specific task to one or more specific Agents. The Agent Tasks page contains three tabs:

- Available Tasks which contain tasks waiting to run.
- Running and Scheduled Tasks which include any tasks that are currently running or scheduled to be run.
- Task History, which provides a list of all previously run tasks.

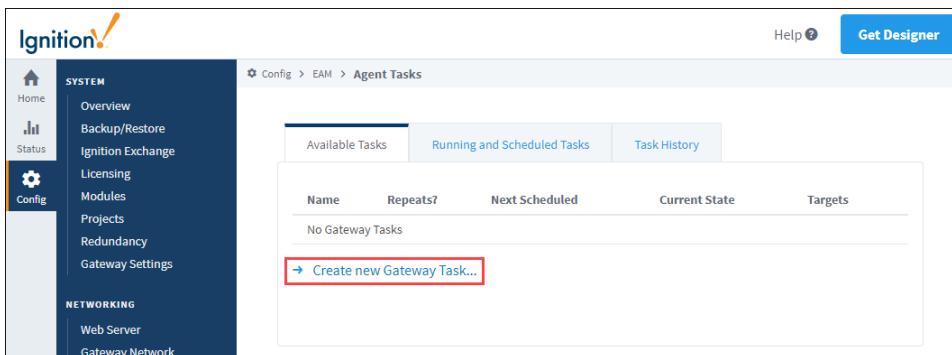
There are many different types of tasks to choose from, but they mostly involve doing Gateway level actions such as taking a Gateway backup or activating a license.

## Create an Agent Task

1. To create an Agent task, go to the Controller, and select the **Config** section on the Gateway Webpage.
2. Scroll down to **Enterprise Administration > Agent Tasks**. This opens the Agent Tasks window.



3. Click the **Create new Gateway Task** link to create an agent task.



The options for Agent tasks are listed in the following table.

Task	Description
Activate License	Activate a license key on selected agent Gateways.
Collect Backup	Collect a Gateway backup from an agent machine.
Install Modules	Install one or more modules on selected agent Gateways.
Remote Agent Upgrade	Prepare a full system upgrade on selected agent Gateways.
Restart Agent	Restarts the Ignition service on the agent machine.

## On this page ...

- [Using the Gateway Network](#)
- [Create an Agent Task](#)
- [Agent Task Status](#)

Restore Backup	Restore a Gateway backup on selected agent Gateways.
Send Project	Distributes a project to remote servers. Replaces the project on the remote server as if an export/import was performed.
Send Project Resources	Distributes project resources, like windows and templates, to remote servers.
Send Tags	Distributes controller tags to agents. For a better experience, use the Designer to select tags. The task can be saved during tag selection and later executed here.
Unactivate License	Unactivate a license key on selected agent Gateways.
Update License	Update the license on selected agent Gateways.

4. Select task and then click **Next**. The Task scheduling screen is displayed. Tasks can then be scheduled to run in a few different ways depending on your needs. In the example below, the task is set to execute twice per day.

Config > EAM > Agent Tasks

### Task Scheduling

Task Name: Collect Backup

Execute Immediately  
 Execute On Demand  
 Execute Once, Scheduled  
 Execute Once, Delayed

3/10/20  1 : 45 PM

Execute On Schedule

Common Settings: Twice Per Day (0 0,12 \* \* \*)

Minutes	0 <input checked="" type="radio"/> :00 (0)
Hours	0,12 <input checked="" type="radio"/> Custom
Days	* <input checked="" type="radio"/> Every Day (*)
Months	* <input checked="" type="radio"/> Every Month (*)
Weekdays	* <input checked="" type="radio"/> Every Day (*)

Expression Descriptor: At 12:00 am and 12:00 pm (0 0,12 \* \* \*)

< Previous    Next >    **Finish**

5. Click **Next**. The EAM wizard will guide you through setting up your task.  
 6. Lastly, a Task Summary window appears. If you're ready to go, click **Finish**. Your task will be submitted according to the schedule type you defined.

The screenshot shows a configuration interface for 'Agent Tasks'. At the top, there's a breadcrumb trail: Config > EAM > Agent Tasks. Below it is a 'Task Summary' section with a table:

Task Name	Task Type	Schedule	Target Groups/Agents	Force Backup
Collect Backup	Collect Backup	Execute at 12:00 am and 12:00 pm	Default Group	true

At the bottom right of this section are three buttons: '< Previous' (blue), 'Next >' (grey), and 'Finish' (blue).

## Agent Task Status

On the Status section of the Gateway Webpage there is a page called **EAM Tasks**. This page is useful, as it shows information on what tasks are currently running, which tasks are scheduled to run, and a history of tasks that have been run. The **EAM Tasks** page can be used to allow users to see what is going on with the various agents without giving them the ability to configure them.

The screenshot shows the 'EAM Tasks' status page under the 'Systems' tab. It includes a 'Configuration' button in the top right corner.

**Executing Agent Tasks:** Shows 0 executing tasks.

**Scheduled Agent Tasks:** Shows 2 scheduled tasks:

Task Name	Task Type	Repeats	Next Execution Start	Status	Action
Collect Backup	Collect Backup	true	20Oct2016 00:00:00	⌚ Scheduled	<button>Pause</button>
Restart agent	Restart agent	false	22Oct2016 00:00:00	⌚ Scheduled	<button>Pause</button>

**Recently Completed Tasks:** Shows a list of completed tasks with their results:

Task Name	Task Type	Task Start	Agent	Task Result
Collect Backup	backup	19Oct2016 11:52:01	Agent133	✓ Success
Collect Backup	backup	19Oct2016 11:50:01	Agent133	✓ Success
Collect Backup	backup	19Oct2016 11:48:01	Agent133	✓ Success
Collect Backup	backup	19Oct2016 11:45:01	Agent133	✓ Success
Collect Backup	backup	19Oct2016 11:41:49	Agent133	✓ Success

In This Section ...



# Agent Task - Backup and Restore

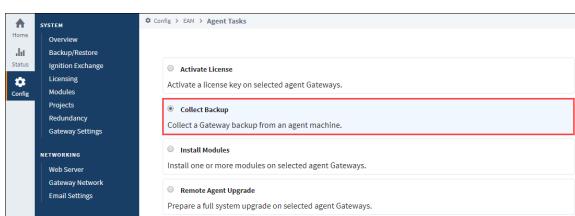
The Backup and Restore tasks are an extremely important part of the Enterprise Administration Module. Performing a Collect Backup is required if you want to do an Agent recovery.

The Gateway Tasks discussed in this section are the [Collect Backup](#), [Restore Backup](#), [Install Modules](#) and [Restart Agent](#).

## Collect Backup

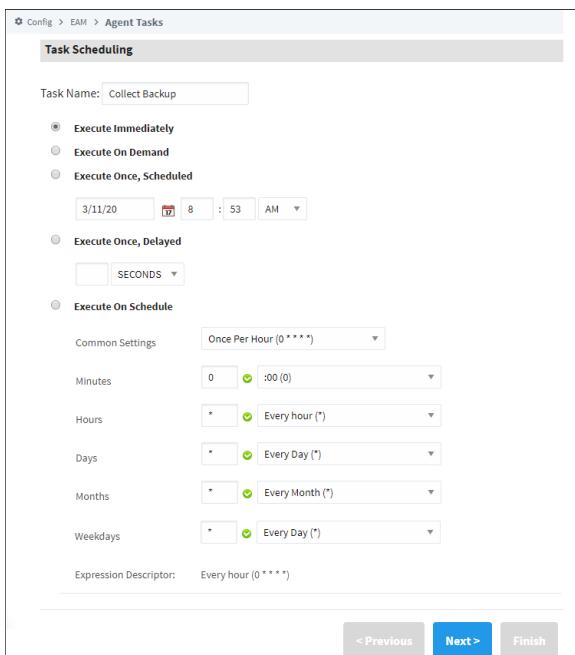
Collect Backup is a Gateway Task that performs a Gateway backup on the selected Agent's machine. Additionally, this task will archive copies of the Agent's modules.

1. On the **Controller**, navigate to **Config > Enterprise Administration > Agent Tasks**.
2. Click on [Create new Gateway Task](#).
3. Collect Backup is one of the several Gateway tasks you can perform. Select **Collect Backup**, and press **Next**. The EAM Task wizard will walk you through each step of the Collect Backup process.



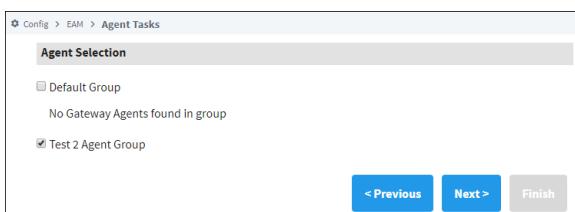
A screenshot of the 'Agent Tasks' configuration screen. The left sidebar shows 'SYSTEM' and 'NETWORKING' sections. The main area displays a list of tasks: 'Activate License', 'Collect Backup' (which is highlighted with a red border), 'Install Modules', and 'Remote Agent Upgrade'. Each task has a brief description below it.

4. There are several different task scheduling options available. For this collect backup example, choose to **Execute Immediately**, and click **Next**. If you need more information on other scheduling options, refer to [Task Scheduling](#).



A screenshot of the 'Task Scheduling' configuration screen. It shows the 'Task Name' as 'Collect Backup'. Under 'Execute Immediately', the radio button is selected. Below that, there are options for 'Execute Once, Delayed' (with a dropdown for seconds) and 'Execute On Schedule'. The 'Execute On Schedule' section is expanded, showing common settings 'Once Per Hour (0 \* \* \* \*)' and detailed settings for minutes, hours, days, months, and weekdays. At the bottom, the 'Expression Descriptor' is set to 'Every hour (0 \* \* \* \*)'. Navigation buttons at the bottom include '< Previous', 'Next >', and 'Finish'.

5. Select the Agent you want to perform the Collect Backup on, and click **Next**



A screenshot of the 'Agent Selection' configuration screen. It shows a list of groups: 'Default Group' (unchecked) and 'Test 2 Agent Group' (checked). Below the list are navigation buttons: '< Previous', 'Next >', and 'Finish'.

## On this page ...

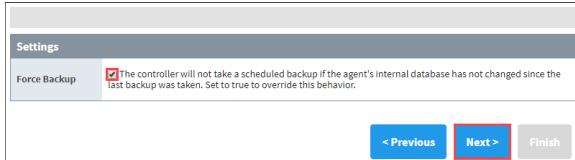
- [Collect Backup](#)
- [Restore Backup](#)
- [Install Modules](#)
- [Restart Agent](#)



## Agent Task - Backup and Restore

[Watch the Video](#)

6. The EAM Task wizard will prompt you if you want to do a Force Backup even if nothing changed since the last backup. This step is optional, but it is useful when your backups are performed on a regular schedule. To be safe, check the **Force Backup** box, and click **Next**.



7. Review the **Collect Backup Task Summary** information, and press **Finish**.



Once the Collect Backup task is complete, a success message will be displayed. You can even check the Task History which will provide a list of all previously executed tasks.

Task Name	Task Type	Schedule	Target Groups/Agents	Force Backup
Collect Backup	Collect Backup	Execute Immediately	Test 2 Agent Group	true

Your new Gateway backup will be stored wherever your Controller settings are pointing to when the Controller was initially created.

To check, go to the **Controller**, and navigate to **Config > Enterprise Administration > Controller Settings**. You can have your Archive Path set to Automatic or Manual. If you have it set to Automatic, you can find your backups inside the directory for Ignition, otherwise, it will be the folder location that is specified in the Controller Settings. To learn more about controller settings, refer to [Creating a Controller](#).

## Controller Settings

[Uninstall Controller](#)

### Main

#### Default Database

MySQL

The database connection to use for recording agent history.

### Archiving

#### Archive Location

Manual

If "Automatic", the system will manage the location of the Agent archive. If "Manual", the path below will be used.

#### Archive Path

C:\eam-archive

The file path to save Gateway backups, archived modules, and other files.

#### Low Disk Space Threshold

1024

Value is in megabytes. Errors will be reported in this Gateway when the disk used for archiving drops below this value.

## Restore Backup

Now, let's restore a Gateway backup on the selected Agent.



### Agent Name and Restoring

When restoring from a backup using this task, the newly restored agent will retain its previous name.

1. On the **Controller**, navigate to **Config > Enterprise Administration > Agent Tasks**
2. Click on the **Create new Gateway Task** link.
3. Select the **Restore Backup**, and press **Next**.

The screenshot shows the Ignition Config interface with the following navigation path: Home > EAM > Agent Tasks. On the left sidebar, under the SYSTEM category, the 'Backup/Restore' option is selected. The main content area displays a list of tasks:

- Activate License
- Collect Backup
- Install Modules
- Remote Agent Upgrade
- Restore Backup** (highlighted with a red border)
- Restart Agent
- Send Project

- Schedule the **Restore Backup** task from any of the listed scheduling options. This example uses **Execute Immediately**, and press **Next**.
- Select the **Agent**, and press **Next**.
- If your Archive Path was set to Manual when you created your Controller, you will have to select the **Choose File** button, and navigate to the folder on your computer to locate the Gateway Backup file. If you are unsure about your Archive Path, refer to your [Controller Settings](#).

The screenshot shows the 'Settings' step of the Agent Task configuration. The 'Gateway Backup Path' field contains the placeholder 'Choose File' with a red border around it. Below the field, a note states: 'This Gateway backup will be distributed to the selected agents. Each agent will then restart.' The 'Restore Disabled' section contains a checkbox with the note: 'If checked, all projects, database connections, OPC connections, etc will be disabled upon restart of each agent.' At the bottom are three buttons: '< Previous', 'Next >', and 'Finish'.

- Once you choose the file, click **Open**. Click **Next** on the Restore Backup task.

The screenshot shows the 'Settings' step of the Agent Task configuration after a file has been selected. The 'Gateway Backup Path' field now displays the full path 'Ignition-backup-20200311-1021.gwbk'. The 'Restore Disabled' section remains the same. At the bottom, the 'Next >' button is highlighted with a red border, while the other buttons are blue.

- Review the Restore Backup Task Summary, and click **Finish**. Once the Restore Backup task completes, you will receive a successful message from the Gateway task.
- Now go to your Agent, and click **Home**. It takes a few moments to bring up the Gateway. You will see a progress bar while the Gateway is starting up. Once it's complete, you will see all your projects uploaded and ready to go.

## Install Modules

This task allows you to install one or more modules on an Agent. You may pass in the modules to install while creating the task, or choose from the archived modules. Modules are archived in the [Collect Backup task](#).

As an example, suppose you accidentally uninstalled the Alarm Notification and OPC UA Modules from your Agent. Let's go ahead and reinstall them using the Install Modules task.

1. Go to the **Controller**, and navigate to **Config > Enterprise Administration > Agent Tasks**. Click the **Create new Gateway Task** link.
2. Select **Install Modules**, and click **Next**.

The screenshot shows the Ignition Controller's 'Agent Tasks' configuration page. On the left is a navigation sidebar with sections like Home, Status, Config, SYSTEM, NETWORKING, and SECURITY. Under 'SYSTEM', 'Modules' is selected. The main area shows five options: 'Activate License', 'Collect Backup', 'Install Modules' (which is selected and highlighted with a red border), and 'Remote Agent Upgrade'. Each option has a brief description below it.

3. Schedule the **Install Modules** task from any of the listed scheduling options. This example uses **Execute Immediately**, and press **Next**.
4. Select the **Agent**, and press **Next**.
5. From the list of **Archived Modules**, click the **Add** buttons for Alarm Notification and the OPC UA modules. You will notice, that once you select a module, it shows up in the **Selected Modules** box at the bottom of the screen. You can choose as many modules as you need, and when you're finished, press **Next**.
6. Review the **Install Modules Task Summary**, and press **Finish**. Once the Install Module task completes, you will get a successful message from the Gateway Task.
7. Go back to your **Agent**, and navigate to **Status > Modules** to verify that both the Alarm Notification and OPC UA modules were installed and are running successfully.

The screenshot shows the 'Module Configuration' screen under 'System'. The 'Modules' tab is selected. The main area displays a table titled 'Inductive Automation' with columns for Name, Version, Description, License, and State. Each row represents a different module, and each row has a 'restart' button. The modules listed include Alarm Notification, Allen-Bradley Driver, DNP3 Driver, Enterprise Administration, Logix Driver, Modbus Driver, Omron Driver, OPC-UA, OpcCom, and Perspective.

Name	Version	Description	License	State	Action
Alarm Notification	5.0.11-SNAPSHOT (b2020030902)	Provides alarm notifications via email	Trial	Running	<button>More</button> <button>restart</button>
Allen-Bradley Driver	5.0.11-SNAPSHOT (b2020030902)	Allen-Bradley driver suite for the OPC UA module.	Trial	Running	<button>More</button> <button>restart</button>
DNP3 Driver	3.0.11-SNAPSHOT (b2020030902)	A driver supporting DNP3 (Distributed Network Protocol) device.	Trial	Running	<button>More</button> <button>restart</button>
Enterprise Administration	3.0.11-SNAPSHOT (b2020030902)	A remote Gateway administration system, allowing you to manage Gateways and automate tasks from a single controller.	Trial	Running	<button>More</button> <button>restart</button>
Logix Driver	4.0.11-SNAPSHOT (b2020030902)	A driver for communicating with Allen-Bradley Logix5000 series PLCs, and includes firmware version 21 support	Trial	Running	<button>More</button> <button>restart</button>
Modbus Driver	6.0.11-SNAPSHOT (b2020030902)	A driver for communicating with devices via Modbus-TCP.	Trial	Running	<button>More</button> <button>restart</button>
Omron Driver	2.0.11-SNAPSHOT (b2020030902)	Drivers for Omron PLCs.	Trial	Running	<button>More</button> <button>restart</button>
OPC-UA	8.0.11-SNAPSHOT (b2020030902)	Provides Ignition's OPC UA client and server functionality.	Trial	Running	<button>More</button> <button>restart</button>
OpcCom	5.0.11-SNAPSHOT (b2020030902)	Bridge that exposes COM based OPC-DA servers to the system.	Trial	Running	<button>More</button> <button>restart</button>
Perspective	1.0.11-SNAPSHOT (b2020030902)	A module that provides modern, responsive html based graphical interfaces for Ignition projects.	Trial	Running	<button>More</button> <button>restart</button>

## Restart Agent

On the Controller, let's create another Gateway Task to restart the agent. This task will stop the Ignition service on the Agent and start it back up again.

1. Go to the Controller, and navigate to **Config > Enterprise Administration > Agent Tasks**.
2. Click on the **Create new Gateway Task** link.
3. Select the **Restart Agent**, and click **Next**.

The screenshot shows the Ignition configuration interface. The left sidebar has a 'Config' tab selected. Under 'SYSTEM', there are links for Overview, Backup/Restore, Ignition Exchange, Licensing, Modules, Projects, Redundancy, and Gateway Settings. Under 'NETWORKING', there are links for Web Server, Gateway Network, and Email Settings. Under 'SECURITY', there are links for Auditing, Users, Roles, Service Security, Identity Providers, Security Levels, and Security Zones. Under 'DATABASES', there is a link for Connections. The main content area is titled 'Agent Tasks' and lists several options: Activate License, Collect Backup, Install Modules, Remote Agent Upgrade, Restart Agent, Restore Backup, and Send Project. The 'Restart Agent' option is highlighted with a red border.

4. Schedule the Restart Agent task to **Execute Immediately**, and click **Next**.
5. Select the Agent, and click **Next**.
6. Review the **Restart Agent Task Summary**, and click **Finish**. Once the Restart Agent task completes, you will receive a successful message from the Gateway Task.
7. Go to your **Agent** and refresh your page. You will see a progress bar while the Gateway is starting up. This will take a few moments, and once this task completes, your Agent will be up and running.

#### Related Topics ...

- [Agent Task - Send Project](#)

# Agent Task - Licensing

Three of the many tasks that the Enterprise Administration Module (EAM) allows you to perform are License Activations, License Updates, and License Unactivations. This section demonstrates how to activate, update, and unactivate a license from the Controller.

## Before Activating a License

- This section assumes you already have your [Controller](#) and [Agent](#) created.
- Make sure you know your License Key serial number.
- Refer to [Agent Tasks](#) for some more useful tips with this section.

For clarity, each Gateway Webpage is identified with either a Controller or Agent label in the header (top left) so it's clear which machine you are working on.

## On this page ...

- [Before Activating a License](#)
- [Activate License](#)
- [Update a License](#)
- [Unactivate a License](#)



## Agent Task - Licensing

[Watch the Video](#)

## Activate License

1. On your [Agent](#), go to the Gateway webpage and select **Config > Licensing**. You can see that no license is currently installed.

A screenshot of the Ignition configuration interface. The left sidebar has a 'Config' tab selected. Under 'SYSTEM', the 'Licensing' option is highlighted with a red box. The main content area shows the 'Active Licenses' section with a message: 'No License Installed'. It explains the trial version and provides a 'Get a License' button. To the right, under 'License Management', there's a section for activating a license online, which says 'Activate Online' and notes '(Internet access required)'. Below that is a section for offline activation with a 'Activate Offline' button.

2. Activating a license on an Agent must be done from the Controller. On your [Controller](#), go to the Gateway webpage and select **Config > Enterprise Administration > Agent Tasks**.
3. Click **Create new Gateway Task**.
4. Activating a License key is one of several tasks you can perform under **Gateway Tasks**. Click **Activate License**, and then click **Next**. The EAM wizard will walk you through each step of the license activation process.

The screenshot shows the Ignition Config interface. On the left is a sidebar with 'Config' selected. The main area shows 'Agent Tasks' with four options: 'Activate License' (selected), 'Collect Backup', 'Install Modules', and 'Remote Agent Upgrade'. The 'Activate License' box is highlighted with a red border.

5. The Activate License task has several [scheduling options](#). For this example, select **Execute Immediately**, and press **Next**.
6. Select the **Agent** you want to activate the license on, and press **Next**. In this example, Agent133 was selected.

The screenshot shows the 'Activate License' page with 'Agent Selection'. It lists three groups: 'Default Group' (with 'Agent133' checked and highlighted with a red box), 'Ignition-ubuntu' (unchecked), and 'Remote' (unchecked). Below it says 'No Gateway Agents found in group'. At the bottom are buttons: '< Previous' (blue), 'Next >' (highlighted with a red box), and 'Finish' (grey).

7. Enter your license key. You can enter it one of two ways: type it in the **License Key** field if you know it, or press **Auto Assign the License** and the license key will auto populate. Click **Next**.

The screenshot shows the 'Activate License' page with 'License Selection'. It shows 'Agent133' and a 'License Key' field containing 'AAA-AAA' (highlighted with a red box). Below is a link '→ Auto Assign Licenses'. At the bottom are buttons: '< Previous' (blue), 'Next >' (highlighted with a red box), and 'Finish' (grey).

8. The Activate License page will refresh so you can validate your licensing information. Click **Finish**. The screen will refresh to the Gateway Tasks window. A message will be displayed stating that the license was activated successfully.

The screenshot shows the 'Gateway Tasks' window. At the top, a message says 'License AAA-AAA successfully re-activated'. Below are two sections: 'Active Licenses' (listing 'AAA-AAA') and 'License Management' (with a button 'Activate Additional License').

- Now, go to the **Agent** to validate that the Agent license was activated. You may see an Access Denied message. This is because the page was automatically updated. Click the **Return to home page** link to refresh the Ignition Home page on your Agent.
- Click on **Config > Licensing** and verify your License Key on the Agent. This page shows all the modules on your license as well as the versions they are licensed for.

**Note:** If you are running Ignition in Trial Mode on your Agent, there is a chance that the trial timer expired, and the license activation will fail. If this happens, reset the trial timer and resume the activation for the Agent. You can check the status of the installed modules by going to **Config > Modules**. Modules you are licensed for will not expire, only the modules that are being used in Trial Mode.

- It's a good idea to check to see if all your modules are activated. You can check the status of your modules by going to the Gateway Webpage and selecting either **Config > Modules**, or **Status > Modules**. If any modules are still in trial mode, that means your license key didn't include those modules, or there is a newer version than your license allows.

Name	Version	License	Status
Alarm Notification	4.9.0 (b2016101208)	Activated	✓ RUNNING
Allen-Bradley Driver	4.9.0 (b2016101215)	Activated	✓ RUNNING
DNP3 Driver	2.9.0 (b2016101215)	Activated	✓ RUNNING
Enterprise Administration	2.9.0 (b2016101215)	Activated	✓ RUNNING
Logix Driver	3.9.0 (b2016101215)	Activated	✓ RUNNING
OPC-UA	4.9.0 (b2016101215)	Activated	✓ RUNNING
Omron Driver	2.9.0 (b2016101215)	Activated	✓ RUNNING
OpcCom	4.9.0 (b2016101215)	Activated	✓ RUNNING
Reporting	4.9.0 (b2016101208)	Activated	✓ RUNNING
SFC	3.9.0 (b2016101215)	Activated	✓ RUNNING
SMS Notification	4.9.0 (b2016101208)	Trial	✓ RUNNING
SQL Bridge	8.9.0 (b2016101208)	Trial	✓ RUNNING

## Update a License

In the event you need to reload or update a license on your Agent, go to the **Controller**.

- Navigate to **Config > Enterprise Administration > Agent Tasks**.
- Click **Create new Gateway Task**.

3. Select **Update License**, and press **Next**. The EAM wizard will guide you through the license update steps.

The screenshot shows the 'Agent Tasks' section of the EAM interface. On the left, there's a sidebar with various navigation options like Home, Status, Config, Databases, Alarming, Tags, and OPC Client. The 'Config' option is currently selected. In the main content area, under 'Agent Tasks', there are several options: 'Send Project', 'Send Project Resources', 'Send Tags', 'Unactivate License', and 'Update License'. The 'Update License' option is highlighted with a red border. A 'Next >' button is located at the bottom right of the task list.

## Unactivate a License

If you need to unactivate a license, go to the Controller's Gateway Webpage.

1. Navigate to **Config > Enterprise Administration > Agent Tasks**.
2. Click **Create new Gateway Task**.
3. Select **Unactivate License**, and click **Next**. The EAM wizard will guide you through the unactivate license steps.

This screenshot is identical to the one above, showing the 'Agent Tasks' page with the 'Update License' option highlighted. The sidebar and overall layout are the same, with the 'Config' option selected in the sidebar.

[Related Topics ...](#)

[Agent Task - Scheduling](#)

[Agent Task - Backup and Restore](#)

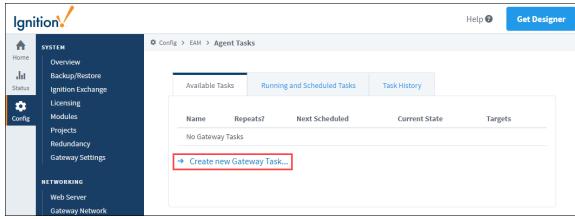
# Agent Task - Send Project

Agent Tasks have the ability to send projects and project resources from a Controller to an Agent.

## Send Project Task

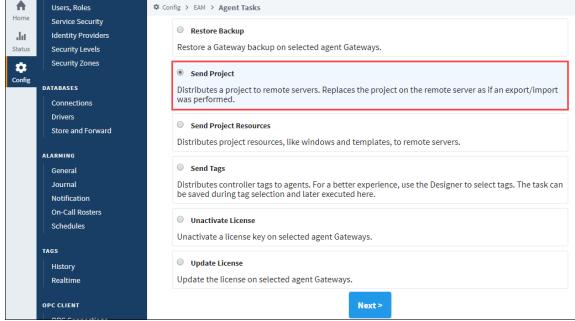
On the **Controller**, under the **Config** section of the Gateway Webpage, go to **Enterprise Administration > Agent Tasks**. Here you can create a Gateway Task to send a project from the Controller to an Agent.

1. Click the **Create new Gateway Task** link. The EAM wizard will guide you through each step of the Send Project task.



2. Not only will the Send Project send a project from the Controller to the Agent, but if the project already exists on the Agent, it will replace it.

Scroll down the list of Gateway Tasks, and select **Send Project**. Press **Next**.



3. Just like with any Gateway Task, the Send Project task needs to be scheduled. There are several scheduling options available, but for this example, schedule the task to **Execute Immediately** and press **Next**.

4. Select the **Agent** where you want to send your project, and press **Next**.

## On this page ...

- [Send Project Task](#)
  - [Inherited Resources](#)
- [Send Project Resources Task](#)
  - [Sending Global Resources](#)
  - [Sending Project Resources Example](#)
- [Send Tags Task](#)
  - [Configuring the Task from the Gateway](#)
  - [Running the Task in the Designer](#)



## Agent Task - Send Project

[Watch the Video](#)

## Send Project

### Agent Selection

Default Group  
 Agent133  
 Agent99  
 Ignition-ubuntu

Remote  
 No Gateway Agents found in group

Include the controller as a target

**< Previous** **Next >** **Finish**

5. The EAM wizard knows your controller and agent configuration. It's going to prompt you to choose the machine where your project is located. In this example, the project that you want to send is located on the Controller or Gateway Source so select **Local System**, and press **Next**.

Config > EAM > Agent Tasks

Source Gateway

Choosing the 'Local system' option below will cause projects and resources to be sent directly from this machine. If an agent is chosen, the system will first retrieve projects and resources from that agent before being sent to target agents.

Local system

Default Group  
 No running agents found

**< Previous** **Next >** **Finish**

6. The EAM wizard will display all your projects from your local system. Select the project you want to send to your Agent, and press **Next**. (If you select your Agent on the previous screen, the EAM wizard will display all your projects running on your Agent that were sent over previously from the Controller).

Ignition!

Config > EAM > Agent Tasks

Select Project

Project\_West\_1  
 Project\_West\_Bldg\_1  
 Project\_East\_A

**< Previous** **Next >**

7. The EAM wizard summarizes all the information for you to review. Press **Finish**, and your project will be sent from the **Controller** to the **Agent**.

Ignition!

Config > EAM > Agent Tasks

Task Summary

Task Name	Task Type	Schedule	Target Groups(Agents)	Target the Controller	Source Gateway	Project to Send
Send Project	Send Project	Execute Immediately	Test 2 Agent Group	false	Local system	Project_West_1

**< Previous** **Next >** **Finish**

8. The EAM wizard will execute the task, the screen will refresh, and a message will pop up stating that your Send Project task was successful.
9. To verify that your project was sent, go to your **Agent**, click on the **Configure** tab on the Gateway Webpage, and select **Projects**.

This feature is new in Ignition version **8.1.4**  
[Click here](#) to check out the other new features

## Inherited Resources

As of 8.1.4, an option was added to send-project task to "include inherited resources" when sending a project from the Controller to an Agent. If checked, the selected project and any inherited resources will be combined into a single project on the target agents.

A checkbox was added to the Agent Tasks, as shown in the image below, to include inherited project resources. The default is false.

## Send Project Resources Task

You can also send project resources, such as project templates, windows, transaction groups, pipelines and even script modules from the Controller to an Agent.

## Sending Global Resources

Global Resources may now be sent with the Send Project Resources Task. Resources such as Shared Scripts and Alarm Pipelines may be sent to any Agent. When selecting a destination project, Global resources may only be sent to the "Global project" on the Agent.

## Sending Project Resources Example

- On the **Controller**, under the **Config** section of the Gateway Webpage, go to **Enterprise Administration > Agent Tasks**. Let's create another Gateway Task to send project resources from the Controller to the Agent.
- Click the **Create new Gateway Task** link. The EAM wizard will guide you through each step of the Send Project Resources task.

- Click on the **Send Project Resources** radio button, and press **Next**.

The screenshot shows the Ignition Config interface with the 'Config' tab selected. On the left, there's a sidebar with 'Config' highlighted. The main area shows 'EAM > Agent Tasks'. There are several options: 'Restore Backup', 'Send Project', 'Send Project Resources' (which is highlighted with a red box), 'Send Tags', 'Unactivate License', and 'Update License'. A 'Next >' button is at the bottom right.

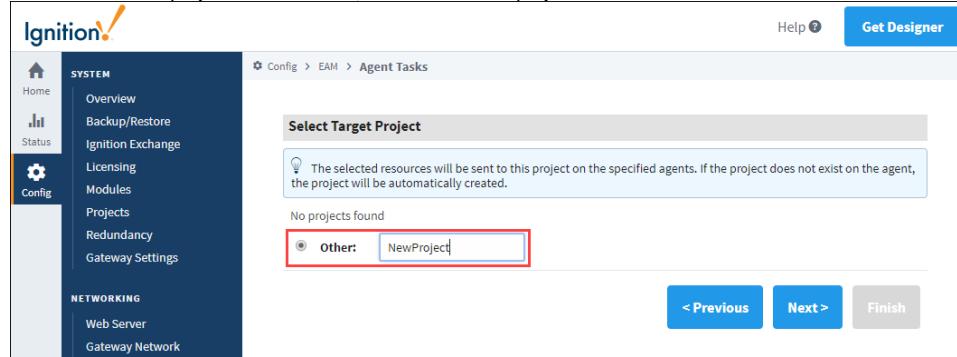
- Schedule the Send Project Resources task to **Execute Immediately**, and press **Next**.
- Select the **Agent** on the Agent Selection window, and press **Next**.
- Select the Source Gateway / **Local System** where your project resources reside, and press **Next**.
- This example sends selected resources from the Training project on the Controller to the Agent. We selected **Project East**. Click **Next**.

The screenshot shows the 'Select Project' screen. It lists three projects: 'Project\_West\_1', 'Project\_West\_Bldg\_1', and 'Project\_East\_A'. 'Project\_East\_A' is highlighted with a red box. At the top right are 'Help' and 'Get Designer' buttons.

- You can see all the resources inside of the Training Project. Of course, real projects will have many more useful project resources than are shown here. It can include templates, windows, transaction groups, pipelines and script modules. Choose whatever resources you want to send to the agent, and press **Next**.

The screenshot shows the 'Select Resources' screen. It has sections for 'Platform' (with 'Global Props' and 'all'/'none' buttons) and 'Perspective' (with checkboxes for various resource classes like General Properties, Session Props, etc.). The 'Perspective' section has many checkboxes checked. At the top right are 'Help' and 'Get Designer' buttons.

9. You have the option of either merging the project resources into an existing project or creating a new project on the Agent. In this example, let's create a new project. Select **Other**, and enter a new project name. Press **Next**.



10. The EAM wizard summarizes all the information for you to review. Press **Finish**.  
11. The Gateway Task for Send Project Resources will execute, the screen will refresh, and a message will appear stating that the task was successful.  
12. To verify that the Training project resources were sent, go to your **Agent**, click on the **Configure** tab on the Gateway webpage, and select **Projects**. You can see in this example that '**NewProject**' was created by the EAM controller. If you don't see your new project, refresh the screen by clicking **Projects**.

Once your project and project resources are sent to the Agent, you need to complete the installation of your project. You need to setup your authentication profile, database, and Tag providers. Once this is completed, you are ready to use the project and project resources on your Agent.

## Send Tags Task

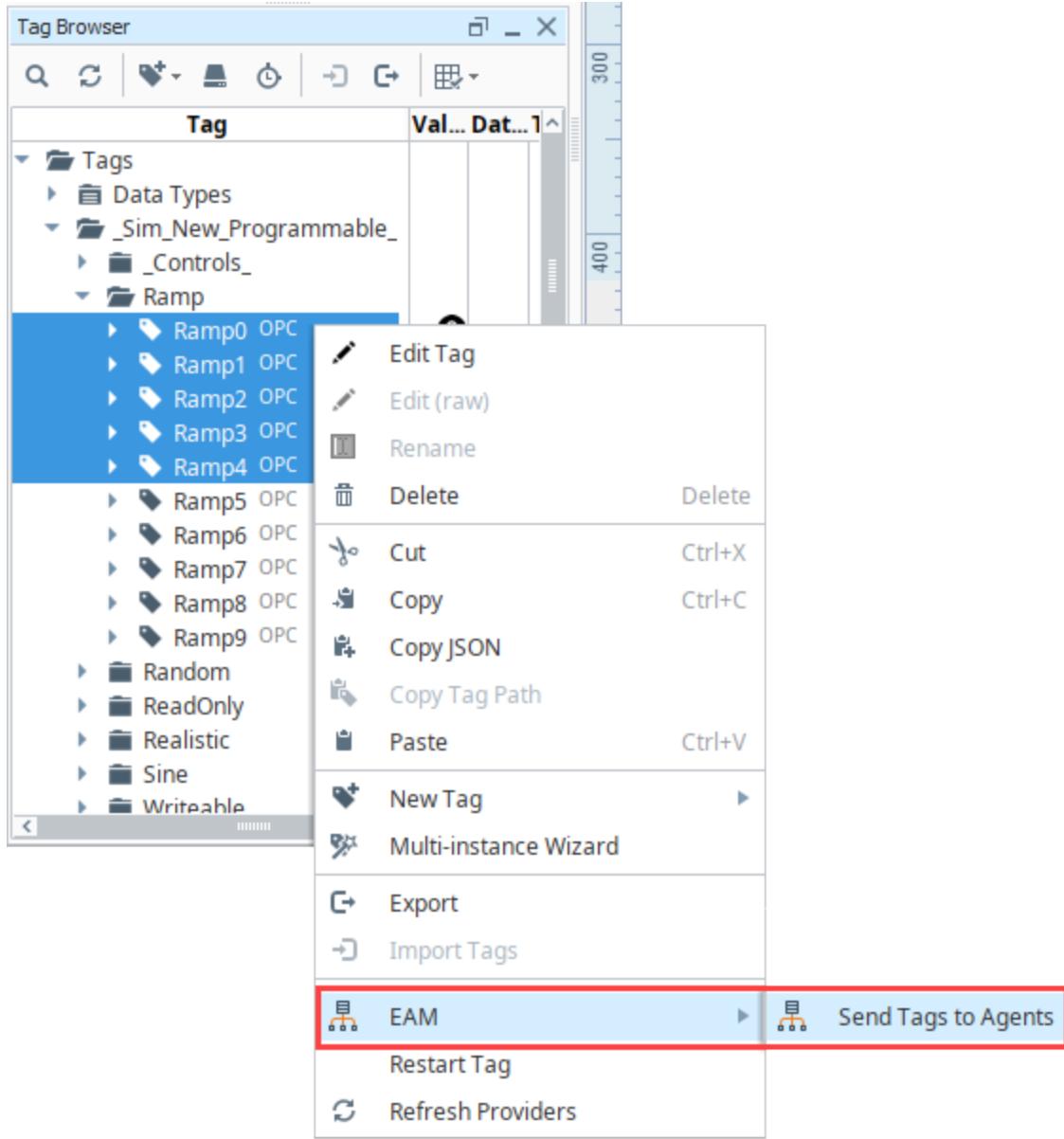
### Configuring the Task from the Gateway

This task allows you to send one or more Tags within a provider on the controller, to one or more agents. Configuring this task is similar to the other Tags, except for the unique options shown below.

The screenshot shows the Ignition Config application interface. The left sidebar has a dark blue background with white text and icons. It includes links for Home, Status, and Config (which is highlighted with a yellow border). Under the Config section, there are four main categories: SYSTEM, NETWORKING, SECURITY, and DATABASES, each with a list of sub-links. The SYSTEM category is currently selected. The main content area has a light gray header bar with the text "Config > EAM > Agent Tasks". Below this is a "Settings" section with a "Target Tag Provider" input field containing a placeholder text: "Tags will be sent to this tag provider on remote gateways." To the right of this field is a "Tag Paths" section containing a large text input area with a single comma separator (','). A descriptive note below the input says: "A comma-separated list. Tags in this list (and their children) will be sent to remote gateways. Existing tags will be overwritten." At the bottom right of the content area are three buttons: "< Previous" (blue), "Next >" (blue), and "Finish" (gray).

## Running the Task in the Designer

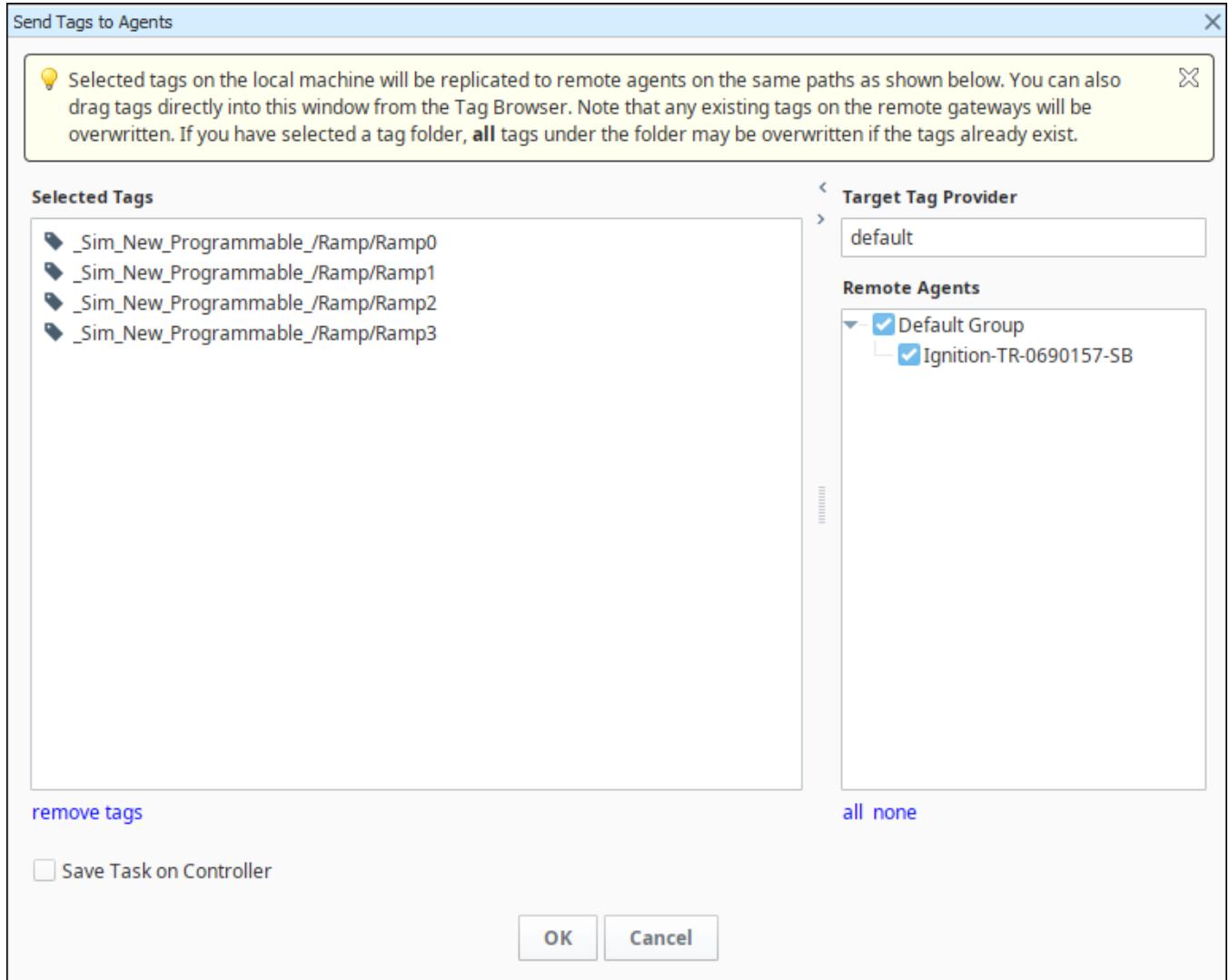
Sending Tags from a Controller Gateway to an Agent Gateway works a little differently than the other Agent Tasks, since the Send Tags Task can be executed from the Designer. Within the Controller's Designer, you can select any number of Tags from the Tag Browser that you want to send to any number of Agents. Right clicking on the Tags brings up the right click context menu, which now has a new **EAM > Send Tags to Agents** option.



Selecting the **Send Tags to Agents** option brings up a new window, allowing you to remove any accidentally selected Tags, as well as select which Agents will be receiving the Tags and the Tag Provider to insert them into.

Clicking the **OK** button will begin the process of sending the Tags to the Agents. Once the Tags have all been sent, you will get a new popup, letting you know of the success.

While you can't initiate this task from the Gateway Webpage, you will be able to see it as a running task, as well as find it listed in your task history after running.



Related Topics ...

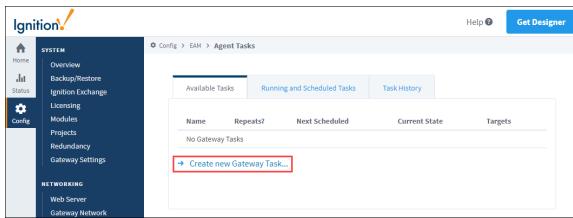
- [Automated Agent Installation](#)

# Agent Task - Scheduling

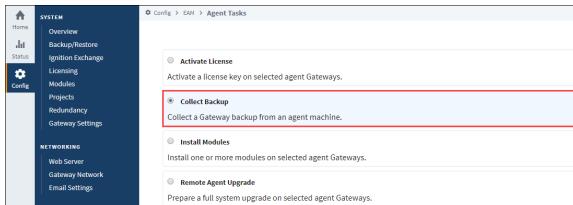
## Agent Gateway Tasks

Agent Gateway tasks are enormously useful for applying an action to many agent Gateways at once. To create a new task, or to view running tasks, navigate to **Config > Enterprise Administration > Agent Tasks**. The Gateway Tasks page will display scheduled tasks, currently executing tasks, unscheduled tasks that can be run on demand, and task history.

1. To create a new task, click **Create new Gateway Task**. The EAM wizard will guide you through each step of a Gateway task.



2. Select the type of task you wish to execute. After you selected a type of task, click the **Next** button.



3. Set the task name to a descriptive name of your choice. The following scheduling options are available:

Option	Description
Execute Immediately:	The task will begin execution as soon as you complete the wizard.
Execute On Demand:	The task will not be scheduled, but is available for immediate execution at any time after you complete the wizard.
Execute Once, Scheduled:	The task will run once at the date and time that you specify.
Execute Once, Delayed:	The task will run once after the specified number of seconds, minutes, hours, or days.
Execute On Schedule :	This type of schedule uses UNIX cron type scheduling, where a pattern of 5 numbers determines the recurring schedule. For example, "30 3 * * *" means run a task every day at exactly 3:30 AM. Use the dropdowns next to the pattern textboxes to build out the pattern for the schedule.

After you determined your task schedule, click **Next**.

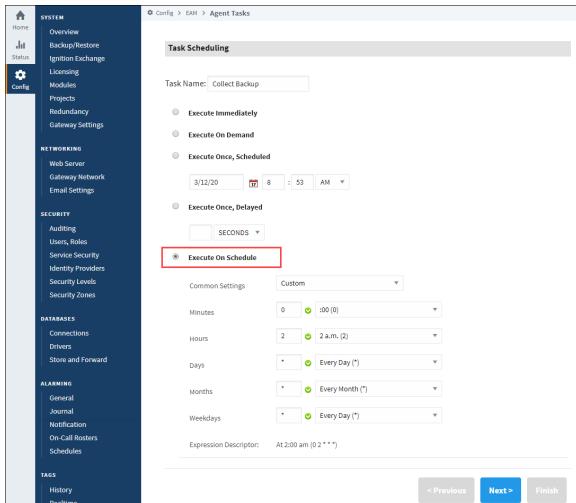
## On this page ...

- [Agent Gateway Tasks](#)
- [Gateway Task Results](#)
- [Running a Task Outside its Schedule](#)
- [Pausing and Canceling Tasks](#)
  - [Pause and Resume](#)
  - [Cancel](#)



## Agent Task Scheduling

[Watch the Video](#)



4. Next, select the agent groups or individual agents that will be included when the task executes. You can select agents that are not currently connected, but you cannot select pending agents. Depending on the type of task, you may need to complete another page to add some information required for that task. If not, you can click the **Finish** button to schedule the task.

## Collect Backup

### Agent Selection

Default Group

- Agent133
- Agent99
- Ignition-ubuntu

Remote

No Gateway Agents found in group

**< Previous**    **Next >**    **Finish**

## Gateway Task Results

Gateway task execution is reported in the agent\_events table in the controller's configured database. The individual result of the task execution for each agent is report as a separate entry. For example, the following query will return the results of all task executions:

```
select * from agent_events where event_category = 'task' order by event_time desc;
```

A task that completed normally for an agent will contain the text NORMAL in the event\_level field. If an error occurred for an agent, the event\_level field is set to ERROR, and the error message is recorded in the message field.

## Running a Task Outside its Schedule

You can run any task outside the task's normal schedule by clicking the **More** button and "run now" link on the right side of the task. Keep in mind:

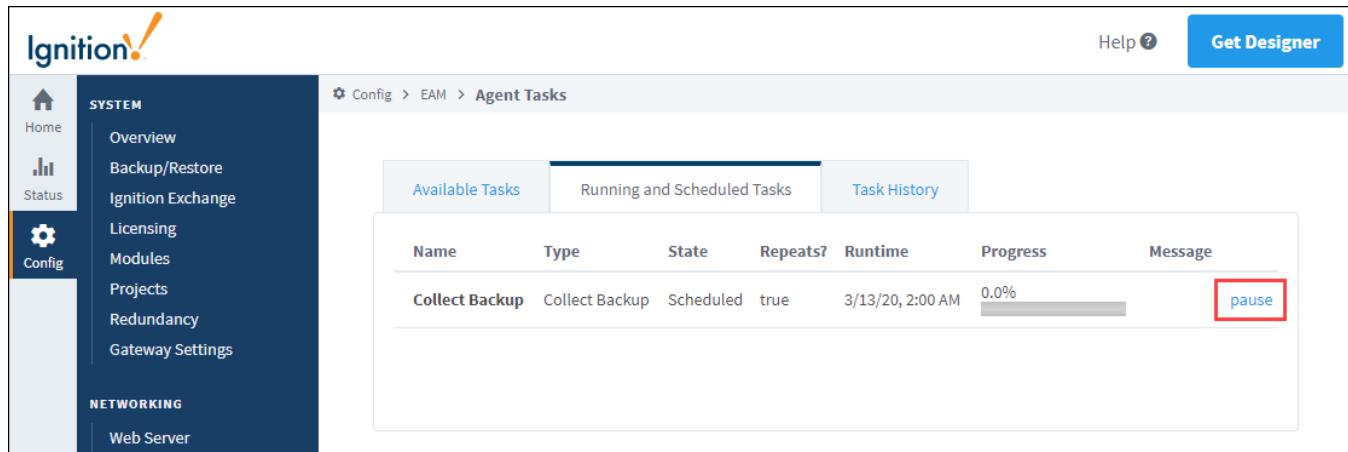
- Tasks that have been scheduled to run immediately are already running, and the "run now" link will not be visible.
- A task that has been scheduled to execute only once at a scheduled time or after a delay will be rescheduled to run immediately. The task will not run again after it has been rescheduled.
- A scheduled task will continue to run at its normally scheduled time, even if you run the task now.

## Pausing and Canceling Tasks

### Pause and Resume

After most tasks are created, they are put onto the task schedule. The exception to this is on demand tasks, which are not put on the schedule until you click the "run now" link. After a task has been added to the schedule, you can pause and resume the task. The state of the task (scheduled, running, waiting) and the scheduling configuration affect how the task is paused and resumed.

Task configuration	Pause action	Resume Action
Task is currently running or waiting	System will attempt to cancel outstanding calls to remote servers.	System will run the task again against any servers that were outstanding when the task was paused.
Task is scheduled once at a specific date and time	The task will be temporarily taken off the schedule.	If the specified time has not yet arrived, the task will be put back onto the schedule at the original time. If the specified time has already passed, the task will execute immediately upon resume.
Task is scheduled once after a specified delay	The task will be temporarily taken off the schedule.	The task will be put back onto the schedule at the original calculated time. For example, if the delay is set to 2 hours, and the task is paused for 1 hour, the task will fire in 1 hour after resume. If the delay period has already passed, it will fire immediately after resume.
Task is on a recurring schedule	All future iterations of the task will be temporarily taken off the schedule.	The task will <b>not</b> fire if task iterations have been missed when the task was paused. The task will return to firing on its normal schedule.



The screenshot shows the Ignition software interface with the following details:

- Header:** Ignition! > Help ? > Get Designer
- Left Sidebar (Config):** Home, Status, Config (selected), Overview, Backup/Restore, Ignition Exchange, Licensing, Modules, Projects, Redundancy, Gateway Settings.
- Current Page:** Config > EAM > Agent Tasks
- Task List:** Available Tasks, Running and Scheduled Tasks (selected), Task History.
- Task Details:** Name: Collect Backup, Type: Collect Backup, State: Scheduled, Repeats?: true, Runtime: 3/13/20, 2:00 AM, Progress: 0.0%, Message: (empty). A red box highlights the 'pause' button next to the task name.

### Cancel

Scheduled one-shot tasks can be cancelled at any time before the task starts. Scheduled one-shot tasks include tasks that are scheduled to fire once after a delay or fire at a specific time. Running tasks can also be cancelled, but there are no guarantees about how much of the task is processed at the time of cancel. Keep in mind that cancelling a task will cause also delete the task at the same time, and it cannot be retrieved after cancel.

# Agent Management

## Maintaining Your Agents

There are a variety of tools available that allow you to manage certain parts of your agent Gateways that are not scheduled tasks. If your agent goes down, agent recovery makes it easy to get your agent back up and running again as quickly as possible, from backups that were taken from the Controller Gateway. In addition, you can create configuration files that can automatically setup an agent when starting the Gateway instead of having to go through the agent configuration wizard. This makes it easy to set up multiple agents.

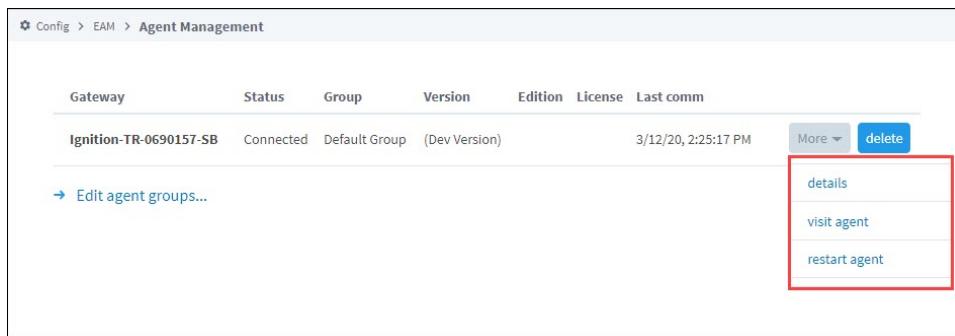
## On this page ...

- [Maintaining Your Agents](#)
- [Agent Management](#)
- [Agent Groups](#)

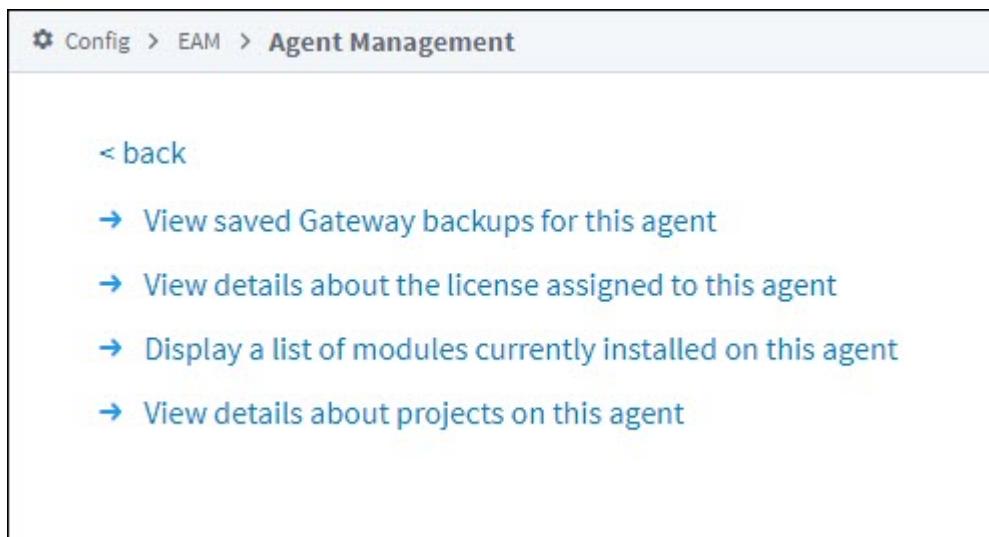
## Agent Management

Once the agent is setup and connected, the **Setup** option disappears on the controller, and is replaced with a list of Enterprise Administration menu options.

1. On the controller, go to the **Config** section of the Gateway Webpage.
2. Scroll down to **Enterprise Administration > Agent Management**. You'll notice that each agent row is expandable with a **More** button on the right side which displays tasks you can perform: **Details**, **Visit Agent**, and **Restart Agent**.  
**Details:** Takes you to an agent details screen.  
**Visit Agent:** This is a link that takes you to the Gateway Webpage of that agent.  
**Restart:** Creates a Gateway task that immediately restarts the agent Gateway. After clicking the link, you will be asked to confirm that you really want to restart the agent.



If you select the **details** option, you can view agent details on your Gateway backups, license, installed modules, and projects.



The following are the options in the Agent Details.

Option	Description
--------	-------------

<b>View Saved Gateway Backups</b>	Opens a page that allows you to view all Gateway backups and modules that have been archived for this agent. You can schedule a Gateway task to restore a specified Gateway backup from this page by using the <b>Restore Backup</b> link.
<b>View Details about the License</b>	Opens a page which compares the agent's current license to the license key on file at Inductive Automation. This page is handy when you have purchased new software for a license, and you need to verify that your agent's license key is up to date. You can update the license for this agent by clicking the "Update Agent License" link at the bottom of the screen. This will schedule a Gateway task to immediately update the license on the agent.
<b>Display a List of Installed Modules</b>	Opens a page that displays all modules that are currently installed in the agent Gateway. The module version and the current state of each module is also displayed
<b>View Details about Projects</b>	Opens a page that displays all projects that currently exist on the agent. The Project Source field is populated by the controller name if the project was deployed to the agent by the controller via a Gateway task.

## Agent Groups

Agents can be grouped into groups that you create. This allows you to organize agent lists by location or agent function. Agent groups can also be selected in Gateway tasks. For example, you can create an agent group for a location that collects backups every night at 3AM. Any new agent that is added to the group will automatically be included when the Gateway tasks executes.

1. To edit and create agent groups, go to the **Config** section on the Gateway Webpage.
2. Scroll down to **Enterprise Administration > Agent Management**, and click **Edit agent groups** at the bottom of the page.
3. To assign an agent to a group, check the checkbox on the left side next to the agent name. Then locate the agent groups dropdown on the right side next to the "Move selected Agents to" link. Select the new group from the dropdown.
4. Then click the **Move selected Agents to** link to move the agents, and click **Save**.

Config > EAM > Agent Management

< back

**Default Group**  check/uncheck all

Ignition-ubuntu  
 Agent133

Move selected agents to **Choose One**

**Remote**  check/uncheck all

No agents in group...

→ Edit group names

**Save**

5. From the Edit Agent Groups page, click on **Edit group names** to create new groups, edit a group name, and delete a group. If you delete a group that contains agents, the agent will be automatically reassigned to the default group.

The screenshot shows a web-based interface for managing agent groups. At the top, there's a navigation bar with links for 'Config', 'EAM', and 'Agent Management'. Below this, a section titled 'Group Name' lists two entries: 'Test 2 Agent Group' and 'Test Agent Group'. Each entry has a 'delete' button and an 'edit' button to its right. At the bottom of the list, there's a blue button labeled 'Create new Group...' with a right-pointing arrow icon. This button is highlighted with a red rectangular box. At the very bottom left, there's a link labeled '< Back'.

In This Section ...

# Agent Recovery

Once the Controller is up and running, you can use it to perform recoveries on Agents. For example, if one of your computers crashed that is running Ignition, you can do a fresh install from a previous backup collection that was performed on your Agent. When the recovery is complete, the Agent will immediately pick up where it left off like nothing ever happened.



## Backup Required to Perform Agent Recovery

Agent recovery requires that a [backup collection](#) on the Agent was performed, otherwise, you will not be able to use this procedure to recover your Agent's instance of Ignition.

## On this page ...

- [Perform an Agent Recovery](#)

## Perform an Agent Recovery

Let's assume that the Agent computer crashed. To check the status, go to your **Controller**, navigate to **Enterprise Administration > Agent Management** and check the status of the Gateway Agent. In this example, you can see that Ignition-TR-0690157-SB is disconnected.

The screenshot shows the Ignition EAM Agent Management interface. On the left, there's a sidebar with 'SYSTEM' and 'NETWORKING' sections. Under 'SYSTEM', 'Config' is selected. The main area shows a table with a single row for 'Ignition-TR-0690157-SB'. The 'Status' column shows 'Disconnected'. Other columns include 'Group' (Default Group (DevVersion)), 'Version' (3.13.20), 'Edition' (233120 PM), and 'License' (None). There are 'More' and 'Delete' buttons at the bottom of the table row.



INDUCTIVE  
UNIVERSIT

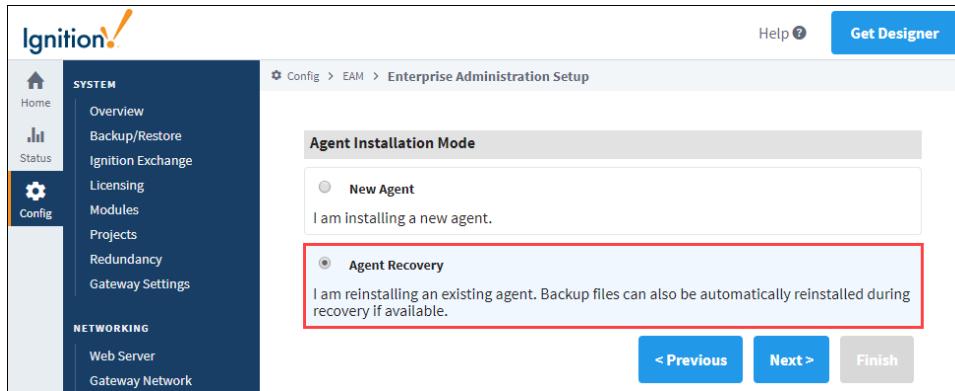
## Agent Recovery

[Watch the Video](#)

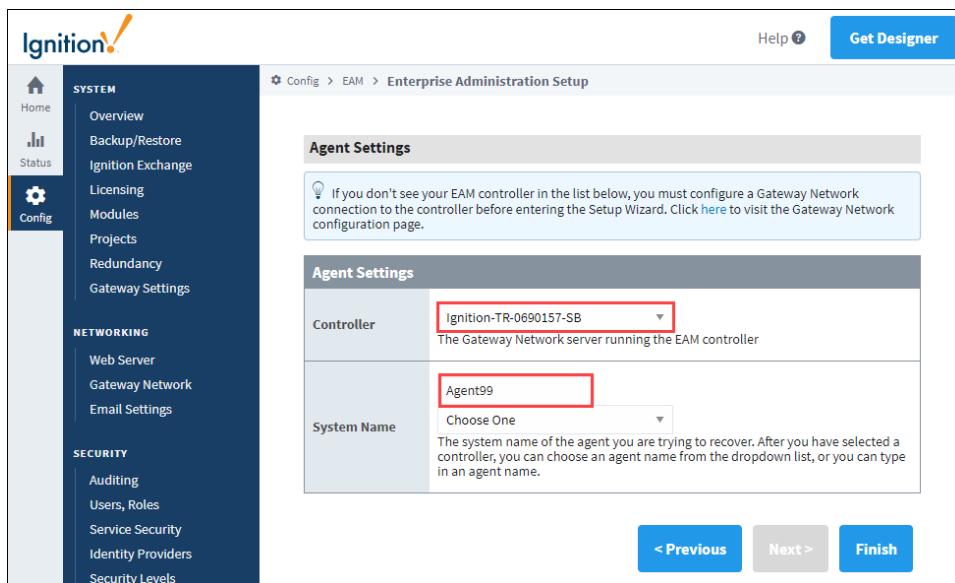
1. On the **Agent** computer, [install Ignition](#) and make sure the EAM Module [is also installed](#) (it is added by default if you use the **Typical** selection during installation).
2. On your **Agent**, go to the **Config** section and select the **Enterprise Administration Setup**. The EAM wizard will walk you through each step of the Agent recovery process.  
Select **Agent** to configure, and press **Next**.

The screenshot shows the Ignition EAM Enterprise Administration Setup interface. On the left, there's a sidebar with 'SYSTEM' and 'NETWORKING' sections. Under 'SYSTEM', 'Config' is selected. The main area shows a 'Select Controller or Agent' dialog. It has two options: 'Agent' (selected) and 'Controller'. The 'Agent' option is described as 'Installs the module as an agent. An agent Gateway needs to be configured to connect to a remote controller Gateway.' The 'Controller' option is described as 'Installs the module as a controller. A controller Gateway can control remote agent Gateways.' At the bottom are 'Previous', 'Next >', and 'Finish' buttons.

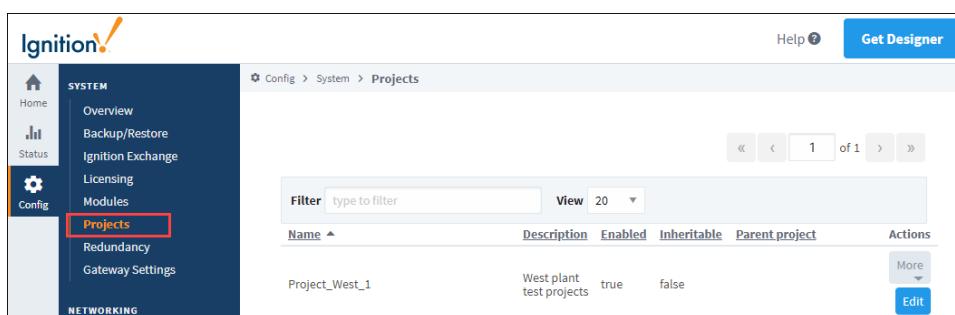
3. In order to continue with the Agent Recovery procedure, you must have a backup collection of the Agent. When you initially setup your Agent on the Controller, you created an [Archive Path](#) where the backup files are stored. EAM will automatically know where to retrieve the backup files. Click on **Agent Recovery**, and press **Next**.



4. Since Agent99 existed previously, the EAM remembered the Agent's prior settings. Select from the list of names in the dropdown lists for the Controller and Agent (or you can type it in). Click **Finish**.



5. The Agent will go through a series of steps: check the Agent status on the Controller, retrieve the Ignition license file, download Ignition modules, and copy the latest Gateway backup to the Agent. When you get a message that the setup is complete, press **Apply Files**. Once you press the Apply Files button, you will see a message stating the Gateway is starting. It will take about a minute to bring the Gateway up.
6. The screen will refresh once the Gateway is up and running. Go to the **Config** section of the the Gateway Webpage, and click on **Projects**. You will notice that all your projects were recovered.



7. It's also a good idea to verify that all your modules are installed and running by going to the **Config** tab and selecting **Modules**.

Name	Version	Description	License	State	Action
Alarm Notification	5.0.11-SNAPSHOT (b2020030902)	Provides alarm notifications via email	Trial	Running	<button>More</button> <button>restart</button>
Allen-Bradley Driver	5.0.11-SNAPSHOT (b2020030902)	Allen-Bradley driver suite for the OPC UA module.	Trial	Running	<button>More</button> <button>restart</button>
DNP3 Driver	3.0.11-SNAPSHOT (b2020030902)	A driver supporting DNP3 [Distributed Network Protocol] device.	Trial	Running	<button>More</button> <button>restart</button>
Enterprise Administration	3.0.11-SNAPSHOT (b2020030902)	A remote Gateway administration system, allowing you to manage Gateways and automate tasks from a single controller.	Trial	Running	<button>More</button> <button>restart</button>
Logix Driver	4.0.11-SNAPSHOT (b2020030902)	A driver for communicating with Allen-Bradley Logix5000 series PLCs, and includes firmware version 21 support	Trial	Running	<button>More</button> <button>restart</button>
Modbus Driver	6.0.11-SNAPSHOT (b2020030902)	A driver for communicating with devices via Modbus-TCP.	Trial	Running	<button>More</button> <button>restart</button>
Omron Driver	3.0.11-SNAPSHOT (b2020030902)	Drivers for Omron PLCs.	Trial	Running	<button>More</button> <button>restart</button>
OPC-UA	8.0.11-SNAPSHOT (b2020030902)	Provides Ignition's OPC UA client and server functionality.	Trial	Running	<button>More</button> <button>restart</button>
OpcCom	5.0.11-SNAPSHOT (b2020030902)	Bridge that exposes COM based OPC-DA servers to the system.	Trial	Running	<button>More</button> <button>restart</button>
Perspective	1.0.11-SNAPSHOT (b2020030902)	A module that provides modern, responsive html based graphical interfaces for Ignition projects.	Trial	Running	<button>More</button> <button>restart</button>

#### Related Topics ...

- [Automated Agent Installation](#)
- [License Management](#)

# Automated Agent Installation

## Automated Agent Installation

The EAM allows an agent Gateway to be automatically configured from text files the first time the Gateway is started. This capability is enormously useful when installing multiple agent Gateways in your network, as otherwise you must install each Gateway, log in, and install and configure the EAM agent. To automatically configure an agent, you must add two files to the Ignition /data folder before startup: init.properties and eam-install.properties. Example contents are below. After the files have been read, they are renamed to .init.properties.bak and .eam-install.properties.bak. A typical application for this capability would be a script that creates the init files and adds them to an ignition.zip that is distributed to many machines.

**Note:** For init.properties, you are not required to use all the settings shown below. The Gateway will use its standard default settings instead.

### Note:

Multiple Gateway Network connection settings are managed by numbering each setting. The first set of connection settings must contain "0" in the setting name after "gateway.network." For example, you can create two outgoing connections with different IP addresses like so:

#### Gateway Network Addresses

```
gateway.network.0.Host=10.20.11.18  
gateway.network.1.Host=10.20.15.23
```

## Example init.properties

### init.properties

```
# SystemName: sets the Gateway name in Gateway Settings  
SystemName=Agent1  
# AutoDetectLocal: set to true to check the first found network interface to determine local IP address. Set to false to manually set the IP address of the Gateway.  
AutoDetectLocal=false  
# LocalInterface: manually sets the IP address of the Gateway. If set, the AutoDetectLocal setting must be set to false  
LocalInterface=10.20.11.17  
# UseSSL: set to true to force all connecting web browsers to connect to the Gateway over SSL  
UseSSL=false  
# PingRate: how often in milliseconds to ping the remote machine  
gateway.network.0.PingRate=1000  
# Enabled: set to false to disable the gateway connection after it is created  
gateway.network.0.Enabled=true  
# Host: the address of the remote machine  
gateway.network.0.Host=10.20.11.18  
# Port: the port of the remote machine.  
gateway.network.0.Port=8088  
# Enable SSL: set to true to use SSL to connect to the remote machine. You must change the Port setting to use the Gateway Network SSL port. This port is 8060 by default.  
gateway.network.0.EnableSSL=false  
# PingTimeout: how long in milliseconds to wait for a ping request to be processed by the remote machine  
gateway.network.0.PingTimeout=300  
# PingMaxMissed: the number of failed pings allowed before the connection state is set to Faulted.  
gateway.network.0.PingMaxMissed=30  
# EnableWebSockets: set to true to allow faster asynchronous communications with the remote machine.  
gateway.network.0.EnableWebSockets=true  
# WebsocketTimeout: how long to wait in milliseconds for a message to be processed over the web socket  
gateway.network.0.WebsocketTimeout=10000  
# HttpConnectTimeout: how long to wait in milliseconds to initially connect the http data channel  
gateway.network.0.HttpConnectTimeout=10000
```

```
# HttpReadTimeout: how long to wait in milliseconds to read data from the http data channel  
gateway.network.0.HttpReadTimeout=60000
```

## Example eam-install.properties

### eam-install.properties

```
# installSelection: always set this setting to Agent  
setup.installSelection=Agent  
# controllerServerName: the Gateway Network server name of the controller  
agent.controllerServerName=Ubuntu-Controller  
# sendStatsInterval: the amount in seconds that the agent will wait before sending new metrics and  
configuration data to the controller. If there are currently no interesting metrics or updated config data  
to send, the agent will not send any data.  
agent.sendStatsInterval=5
```

### Related Topics ...

- [License Management](#)

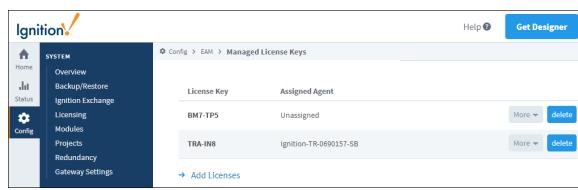
# License Management

## License Management

The License Management page acts as a central repository for managing Ignition licenses. You can preload a list of licenses, view details of a license as it appears on file at Inductive Automation, assign licenses to individual agents, and bulk assign free licenses in the Activate License Gateway task. To visit the License Management page, navigate to **Config** section of the Gateway Webpage, and go to **Enterprise Administration -> License Management**.

### Agent License Reporting

Whenever an approved agent contacts the controller, it sends its license information. The License Management page is automatically updated whenever new or updated license information is received from an agent. This means that even if you install a license directly in an agent Gateway, the license installation will still be known to the controller.



License Key	Assigned Agent
BM7-TP5	Unassigned
TBA-IN8	Ignition-TR-0690157-5B

### License Details

You can click on **More** (on the right side of each license) and select **details** to view modules and versions currently assigned to the license. Note that the information displayed on the License Detail page reflects the license as it appears on file at Inductive Automation. This functionality allows you to confirm exactly which modules and versions are currently assigned to a license.

## On this page ...

- [License Management](#)
  - [Agent License Reporting](#)
  - [License Details](#)
- [Activate and Unactivate a License](#)
- [Preloading Licenses](#)
- [Deleting Licenses](#)



## License Management

[Watch the Video](#)

### Activate and Unactivate a License

The controller acts as a license proxy on behalf of agents. This means that only the controller requires Internet access to the Inductive Automation licensing servers. Whenever you use the License Management page or a Gateway task to assign, update or unactivate a license, the controller will request system information from the agent and forward the information to the licensing servers. If performing an activation, the activation data is sent back to the agent after the data is received from the licensing servers.

### Preloading Licenses

You can preload a list of license keys in the controller. After the license list is loaded, you can individually assign licenses to agents, or assign all free licenses to agents in one step via the Activate License task.

1. To preload a license list, on the Gateway Webpage navigate to **Enterprise Administration > License Management**.
2. Click the **Add Licenses** link.
3. Enter the license keys. Use commas to separate the licenses. The formatting is shown below.

Config > EAM > Managed License Keys

Use commas to separate licenses. Letters do not need to be capitalized.

AAA-AAA, TRN-Rmm, ABC-123

Add

- Click the **Add** button to save preloaded licenses.

## Deleting Licenses

You can remove unused licenses from the License Management page, but only if the license is not currently assigned to any agent. If you want to delete an assigned license, click the **unactivate** link on the right side of the license. After the Assigned Agent field changes to "Unassigned," you can delete the license.

Config > EAM > Managed License Keys

License Key	Assigned Agent
BM7-TP5	Unassigned
TRA-IN8	Ignition-TR-0690157-SB

→ Add Licenses

details

unactivate

### Related Topics ...

- [Agent Task - Scheduling](#)

# Remote Upgrade

Agents can be upgraded remotely from the Controller. This involves uploading the required binary files for the desired architecture as a task. Once the files have been saved, the remote upgrade procedure may be initiated. Both the Agent to be upgraded, as well as the Controller, must be on 7.9.2 to execute a Remote Upgrade.

**Caution:** If attempting to update an Agent from Ignition 7.9 to Ignition 8, the Controller should itself be upgraded to Ignition 8 first.

## Upgrading Redundant Agents

When upgrading a redundant pair of agents, it is recommended that the backup be upgraded before the master.

## Remote Agent Upgrade Task

This task will upgrade the agent(s) upon execution.

This task takes zipped binary files for a version of Ignition, and saves them for upgrades later. Multiple files may be saved for different versions and architectures. Additional modules may be included, allowing for upgrades of [non-standard modules](#) to occur simultaneously.

Note that the zipped binary files differ from the installers: The binary files may be found on the Ignition downloads page, listed below the installers.

The screenshot shows the Ignition Version Archive page. At the top, there's a dropdown menu for 'Ignition Version' set to '8.0.9 STABLE'. Below it, a section for 'Ignition Version 8.0.9 STABLE' is shown, with release date 'Released February 18, 2020' and links to 'System Requirements' and 'Release Notes'. The main content is organized by platform: 'System Installers' (Windows, Linux, macOS), 'Microsoft Windows' (Windows Installer 64-bit, Windows 64-bit zip), 'Linux' (Linux Installer 64-bit, Linux 64-bit zip), and 'macOS' (macOS Installer, macOS zip). Each item has a 'Version' and 'Checksum' column.

Platform	File Type	Version	Checksum
Windows	Windows Installer 64-bit	8.0.9.20200218-ff54	sha256
	Windows 64-bit zip	8.0.9.20200218-ff54	sha256
	Ignition Edge - Windows 64-bit zip	8.0.9.20200218-ff54	sha256
Linux	Linux Installer 64-bit	8.0.9.20200218-ff54	sha256
	Linux 64-bit zip	8.0.9.20200218-ff54	sha256
	Ignition Edge - Linux 64-bit zip	8.0.9.20200218-ff54	sha256
macOS	macOS Installer	8.0.9.20200218-ff54	sha256
	macOS zip	8.0.9.20200218-ff54	sha256
	Ignition Edge - OSX zip	8.0.9.20200218-ff54	sha256

This task only needs to be executed once per version/architecture: multiple upgrades may be performed from the same files.

## Creating the Remote Agent Upgrade Task

1. From the Controller, navigate to the **Config > Enterprise Administration > Agent Tasks**.
2. Click **Create new Gateway Task**.
3. Select the **Remote Agent Upgrade** task from the list of tasks, and then click **Next**.

## On this page ...

- [Upgrading Redundant Agents](#)

[Remote Agent Upgrade Task](#)  
[Creating the Remote Agent Upgrade Task](#)  
[Upgrading the Agent](#)  
• [Remotely Upgrading an Agent](#)

The screenshot shows the Ignition EAM interface. On the left is a sidebar with navigation links: Home, Status, Config (which is selected), NETWORKING (Web Server, Gateway Network, Email Settings), and SECURITY (Auditing, Users, Roles, Service Security, Identity Providers, Security Levels). The main content area is titled 'Config > EAM > Agent Tasks'. It lists several tasks:

- Activate License**: Activate a license key on selected agent Gateways.
- Collect Backup**: Collect a Gateway backup from an agent machine.
- Install Modules**: Install one or more modules on selected agent Gateways.
- Remote Agent Upgrade**: Prepare a full system upgrade on selected agent Gateways. This task is highlighted with a red border.
- Restart Agent**: Restarts the Ignition service on the agent machine.
- Restore Backup**: Restore a Gateway backup on selected agent Gateways.

4. On the **Task Scheduling page**, give the task a name. Like all tasks, you will specify either a group, or several agents, so providing a useful name will make the task easier to identify later. You can leave the schedule set to **Execute On Demand**.

**Note:** This task does not upgrade the agent, it only prepares the files for later. You may continue without worry that the agent will be restarted.

Config > EAM > Agent Tasks

### Task Scheduling

Task Name: **Remote Agent\_5 Upgrade**

Execute Immediately

Execute On Demand

Execute Once, Scheduled

3/13/20  11 : 44 AM ▾

Execute Once, Delayed

SECONDS ▾

Execute On Schedule

Common Settings: Once Per Hour (0 \* \* \* \*)

Minutes: 0 :00 (0)

Hours: \* Every hour (\*)

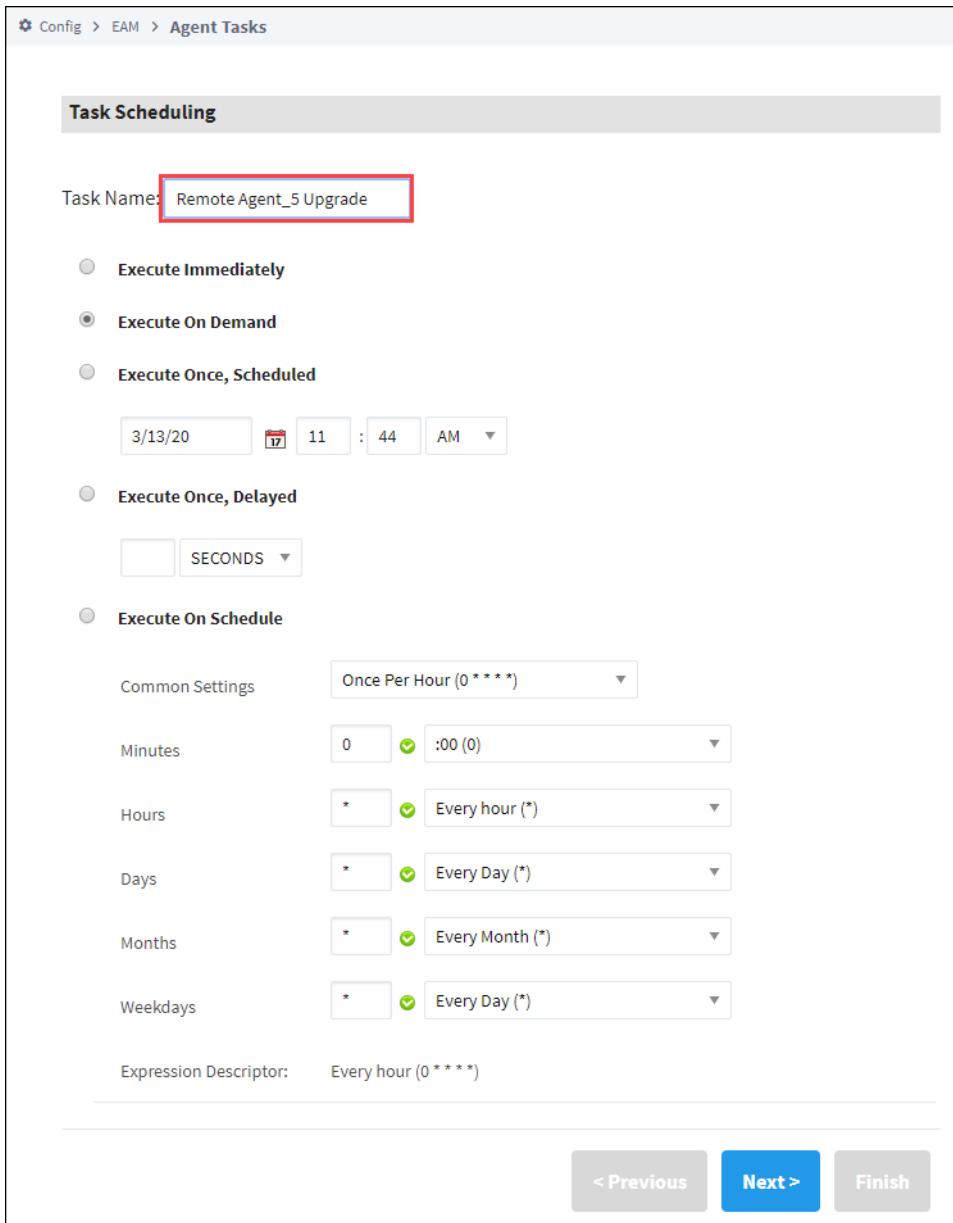
Days: \* Every Day (\*)

Months: \* Every Month (\*)

Weekdays: \* Every Day (\*)

Expression Descriptor: Every hour (0 \* \* \* \*)

< Previous **Next >** Finish



5. Next Select the Agent you want to upgrade. Click **Next**.
6. On the **Remote Agent Upgrade** page, click the **Choose File** button. Navigate to the file you wish to upload, and click **OK**. Note that this page will state the architecture of the Agents that were selected in the previous step. Once finished, click **Next**.

Config > EAM > Agent Tasks

**Select upgrade zip files**

**Architecture: Windows 64-bit**

The agents listed below require a Windows 64-bit Ignition installation .zip file. This file will be sent when this task begins at the scheduled time. The actual upgrade process will not start until you visit the EAM Remote Upgrade page and begin the upgrades.

Choose File No file chosen

Selected zip

Ignition-windows-64-8.0.9.zip	remove
-------------------------------	--------

Agent Status

Ignition-TR-0690157-SB	Ready for upgrade
------------------------	-------------------

< Previous Next > Finish

7. Next, select any additional modules that should be included with this Task. Modules that are not included in the typical installation, such as the [Web Browser Module](#), or even a third party module may be added. Click the **Choose File** button, navigate to the module, and click **OK**. This step is optional, so regardless of whether you add custom modules, click **Next** when you're ready to move on.

Config > EAM > Agent Tasks

**Upgrade custom modules**

You can add upgraded versions of custom modules on this page. Only module upgrades will be performed. The modules will not be installed on agents that do not have the modules installed now. You can also click Next to skip this step.

Choose File No file chosen

Selected Upgrade Version

Allen-Bradley Driver	5.0.11-SNAPSHOT (b2020030602)	remove
----------------------	----------------------------------	--------

< Previous Next > Finish

8. The **Task Summary** page will appear. Review the information, and click **Finish**. The new task will run, and pass the files to the agent. Once complete, the agent will be prepared for a remote upgrade.

Config > EAM > Agent Tasks

**Task Summary**

Task Name	Task Type	Schedule	Target Groups/Agents
Remote Agent Upgrade	Remote Agent Upgrade	On Demand	Ignition-TR-0690157-SB

< Previous Next > Finish

## Upgrading the Agent

Once the files have been passed to the Agent, a remote upgrade may be initiated from the Controller's web interface.

**Note:** As with all upgrades, it is highly recommended to take a backup of the Agent before starting the upgrade process. Information on taking a backup from an Agent can be found on the [Agent Task - Backup and Restore](#) page.

### Remotely Upgrading an Agent

1. To begin a remote system upgrade, on the Controller, navigate to the Gateway Webpage. Select **Config > Enterprise Administration > Remote Upgrades**.



2. Once the Remote Upgrades page appears, you may either click the **Upgrade** button next to the agent you wish to upgrade, or select multiple agents/groups and click the **Upgrade Selected** button.

A screenshot of the 'Remote Upgrades' page. The page title is 'Config &gt; EAM &gt; Remote Upgrades'. A note says: 'Select one or more agents below to begin remote system upgrades. The selected agent Gateways will be shut down and restarted to perform the upgrades. For redundant agent pairs, the backup agent upgrade must be completed before the master agent can be selected.' A table lists an agent: Agent: 'Agent', Role: 'Default Group', Upgrade Status: 'Ready to upgrade', As Of: '4/6/17 5:12 PM', and Status Message: ' '. There are 'Remove' and 'Upgrade' buttons. The 'Upgrade' button is highlighted with a red box. At the bottom are 'Upgrade Selected' and 'Remove Selected' buttons, with 'Upgrade Selected' also highlighted with a red box.

3. A confirmation page will appear. Click the **Confirm** button when ready to proceed.
4. The Remote Upgrades page will appear again. This will report the status of the upgrade. Once complete, the Upgrade Status of the agent will show that the upgrade was successful

Related Topics ...

- [Agent Task - Send Project](#)
- [Agent Task - Backup and Restore](#)

# Redundant EAM Configuration

## Redundant Controller Setup

To set up redundancy on an EAM controller, you first follow the normal [setup process for a redundant master and backup](#). The main difference with EAM is that each agent requires separate Gateway Network connections to both the master controller and the backup controller. The agent will automatically route messages to the active controller. Some items to keep in mind:

- As with any redundant configuration, you cannot make any changes on the backup controller. This includes approving new agents and running agent tasks.
- Agent metrics are only sent to the active controller. This means that EAM agent system Tags will not process data on a backup controller until the backup becomes active.
- Scheduled and running agent tasks on the master controller will be automatically suspended if control is transferred to the backup controller. The tasks will never run on the backup controller. The tasks will resume on the master controller after it resumes control.

## Redundant Agent Setup

As with the redundant controller setup, you follow the same redundant master and backup setup process. Then run the Agent Setup wizard in the same way as you set up a standard agent. After the Agent Setup wizard completes, you must navigate to the controller Gateway and approve both the master and backup pending agents. Some items to keep in mind:

- Both the master agent and the backup agent will send agent metrics. The controller will create a Master folder and a Backup folder of system Tags, allowing you to create a project that monitors both sets of system Tags at the same time.
- Agent tasks list the master agent and the backup agent separately. Tasks that do not change any configuration on an agent can be run without errors on both the master agent and the backup agent (such as the Restart Gateway task and the license tasks). But tasks that do change configuration (such as the Send Project task) will fail on the backup agent, due to the fact that Gateway configuration cannot be changed on a redundant backup.

### Related Topics ...

- [Gateway Network](#)
- [Setting Up Redundancy](#)

# Event Threshold Settings

## Overview

One of the main functions of the controller is to keep track of connected agents and report when an agent starts to experience performance problems, logs many errors in a short time, or unexpectedly goes offline. Agent events are held in the controller's configured database in the `agent_events` table. Within this table, you can find three types of event categories: **agent**, **metric**, and **task**. The agent event category is used for major connectivity events, such as loss of connectivity from an agent. The metric event category is used for events that report abnormal agent health statistics, such as abnormally high CPU usage. The task event category does not affect metrics, and is detailed in the Gateway Task Results section.

## General Settings

To view the event thresholds, go to the Config page on the Gateway Webpage and select **Enterprise Administration Event Thresholds**.



## On this page ...

- Overview
- General Settings
  - Alarm Evaluation
  - Activity Monitor
  - Advanced Properties - System Metric Thresholds



## Agent Event Threshold Settings

[Watch the Video](#)

## Alarm Evaluation

This section is for activity and metric events, you can configure alarms to trigger when an event is reported at the warning or error level. You can also set the alarm pipeline that will process the generated alarms.

Setting	Description
Enable Activity Alarms	If true, alarms will be generated for agent activity events, such as when an agent stops responding.
Enable Metrics Alarms	If true, alarms will be generated for agent metric events.
Enable Task Alarms	If true, alarms will be generated when a scheduled task fails.
Warning Priority	The priority assigned to all of the warning thresholds. Options are: Diagnostic, Low, Medium, High, Critical.
Error Priority	The priority assigned to all of the error thresholds. Options are: Diagnostic, Low, Medium, High, Critical.
Active Pipeline	The Pipeline assigned to all of the warning thresholds. Note that this Pipeline must be created before the alarm event happens, and that the name is case-sensitive.
Ack Pipeline	The Pipeline assigned to all of the error thresholds. Note that this Pipeline must be created before the alarm event happens, and that the name is case-sensitive.

## Activity Monitor

The Activity Monitor configures how agent inactivity is reported. When contact is lost with an agent, an inactivity warning or error event is fired if the configured time in minutes has elapsed since last contact.

Setting	Description
Inactivity Warning (Minutes)	The number of minutes before a warning threshold alarm is activated. (Default is 5.)
Inactivity Error (Minutes)	The number of minutes before an error threshold alarm is activated. (Default is 15.)

## Advanced Properties - System Metric Thresholds

In addition to inactivity alarms, alarms can be set on all agents when certain metrics like CPU usage, number of clients, error rates, and more are reached. Each one has both a **warning** and an **error** level.

Setting	Description
CPU Usage Warning (%)	The warning level of an Agent's CPU usage. (Default is 70.)
CPU Usage Error (%)	The error level of an Agent's CPU usage. (Default is 90.)
Memory Usage Warning (%)	The warning level of an Agent's memory (RAM) usage. (Default is 70.)
Memory Usage Error (%)	The error level of an Agent's memory (RAM) usage. (Default is 90.)
Errors Per Minute Warning	The warning level of an Agent's error rate (minute). The contents of the Agent's errors can be checked in the Agent's console. (Default is 2.)
Errors Per Minute Error	The error level of an Agent's error rate (minute). The contents of the Agent's errors can be checked in the Agent's console. (Default is 5.)
Errors Per Hour Warning	The warning level of an Agent's hourly error rate. The contents of the Agent's errors can be checked in the Agent's console. (Default is 20.)
Errors Per Hour Error	The error level of an Agent's hourly error rate. The contents of the Agent's errors can be checked in the Agent's console. (Default is 60.)
Connected Clients Warning	The number of clients connected to that Agent required to raise a warning alarm. (Default is 50.)
Connected Clients Error	The number of clients connected to that Agent required to raise an error alarm. (Default is 100.)
DB Utilization Warning (%)	Triggered when the utilization of the DB connection pool exceeds the specified percentage. (Default is 80.)
DB Utilization Error (%)	Triggered when the utilization of the DB connection pool exceeds the specified percentage. (Default is 100.)

### Related Topics ...

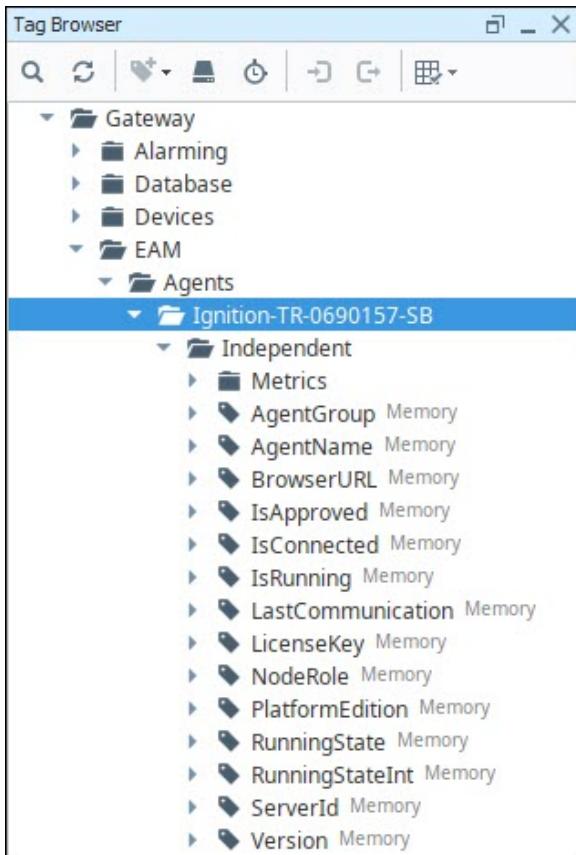
- [EAM in the Designer](#)
- [Perspective Alarm Status](#)
- [Vision Alarm Status](#)
- [Alarm Journal](#)

# EAM in the Designer

The Enterprise Administration Module provides a lot of information about agents inside the Designer that allow you to search agent information to see the status of an agent and history of tasks using Tags, binding functions, and scripting functions. Anything you want to know about an agent can be found using EAM in the Designer.

## Agent System Tags

System Tags are created on the Controller for each agent, allowing you to build EAM monitoring clients, set alarms on individual Tags, and many other Tag-related operations. To view EAM Tags, launch a Designer on the controller Gateway. In the **Tag Browser**, navigate to **System > Gateway > EAM > Agents**. A Tag folder is created for each agent. As with other system Tag values, all EAM system Tag values are read-only.



## On this page ...

- [Agent System Tags](#)
- [Property Binding Functions](#)
- [Scripting Functions](#)
- [Tag Distribution for Development Servers](#)



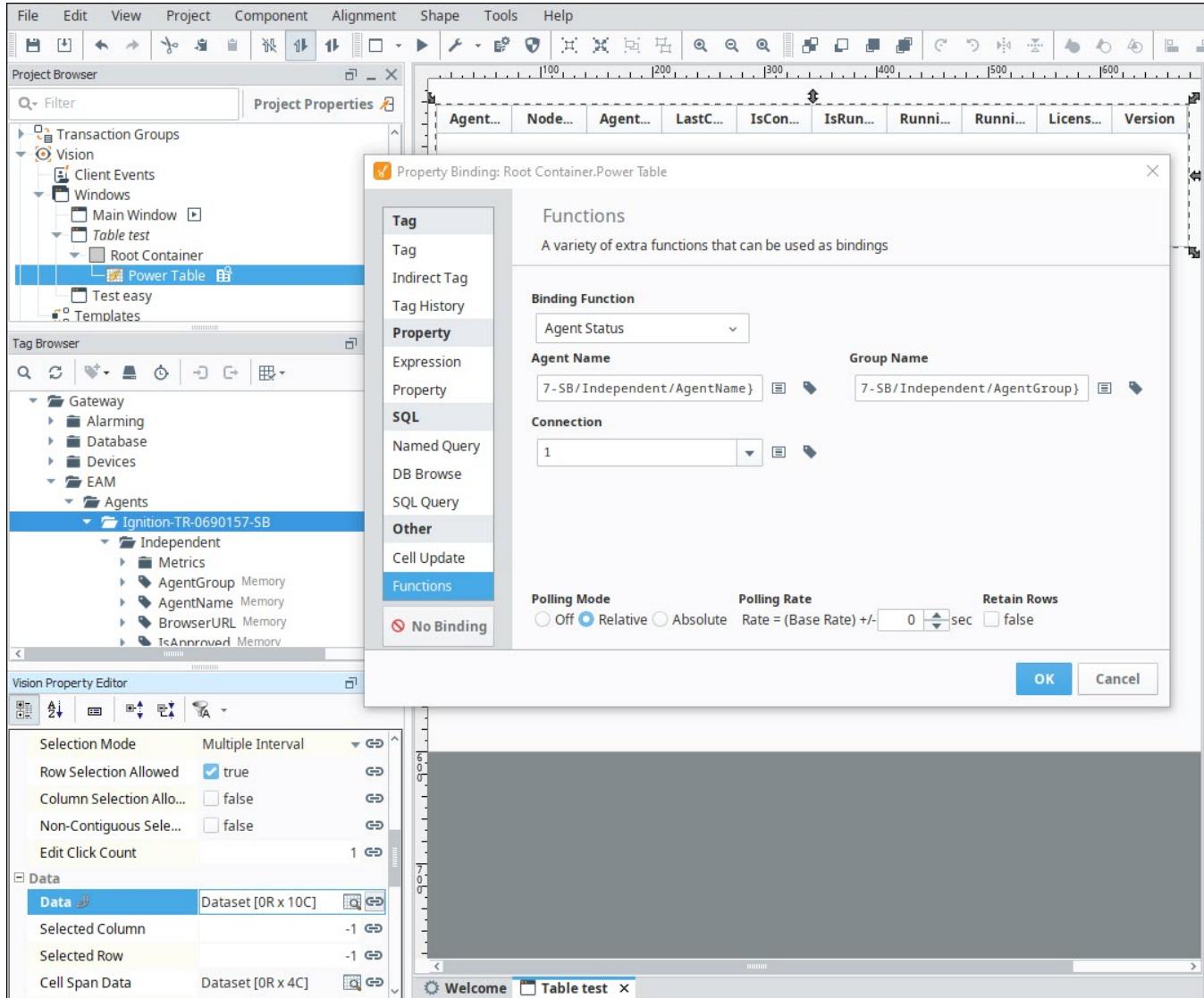
## EAM in the Designer

[Watch the Video](#)

## Property Binding Functions

The EAM adds its own binding functions to the standard property binding functions, allowing you to quickly add agent information to a component such as a table. The following binding functions are available:

- Agent Status:** reports some basic information about each agent, such as platform version, connection status, and the last time a message was received from the agent.
- Agent History:** reports agent events from the the **agent\_events** table in the controller's configured database. Agent events include Gateway task results, abnormal health statistics, and agent communication status events.

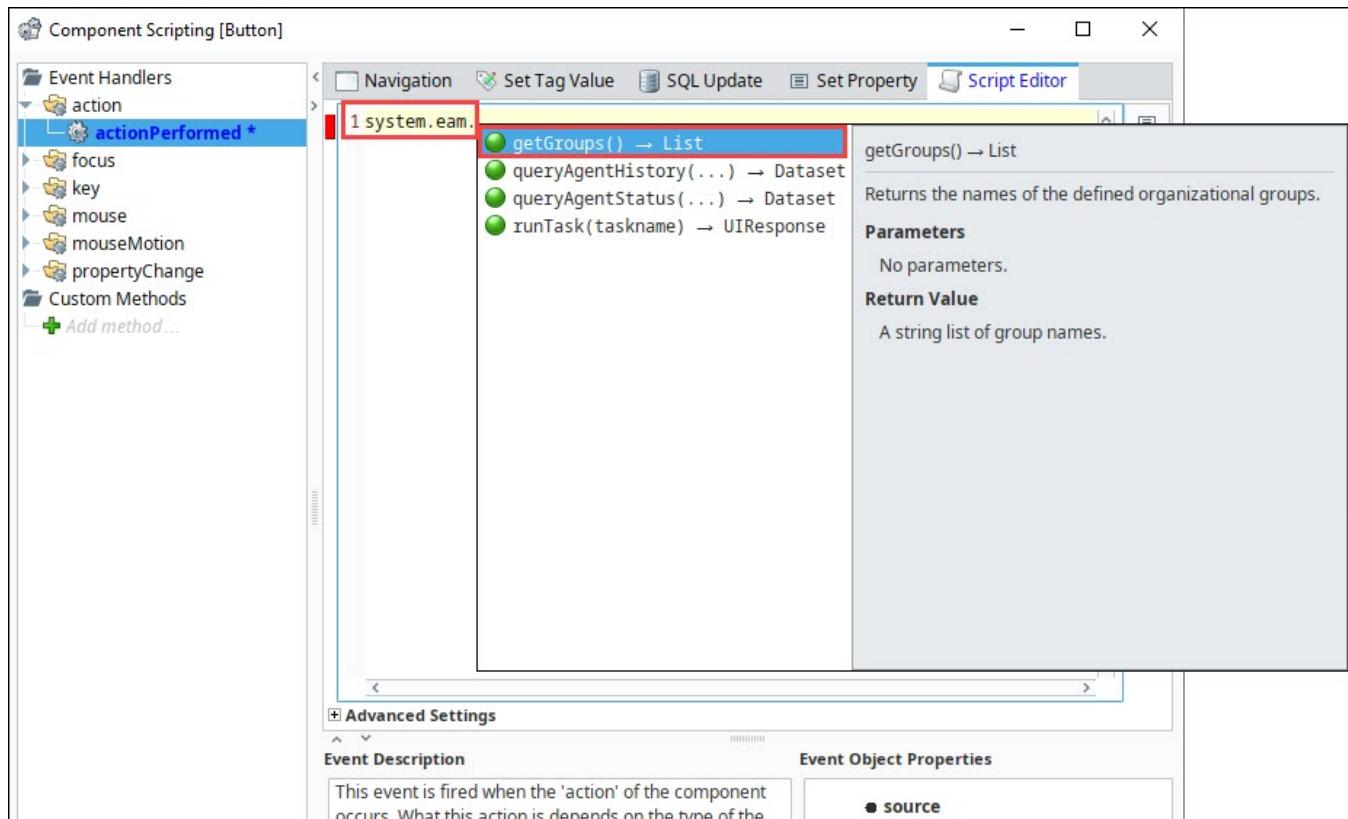


## Scripting Functions

There are several scripting functions that are included in the system.eam package:

- **system.eam.getGroups()**: returns a String list of all agent groups configured in the controller.
- **system.eam.queryAgentHistory()**: returns a Dataset of agent events from the controller's configured database.
- **system.eam.queryAgentStatus()**: returns a Dataset with some basic information about each agent, such as platform version, connection status, and the last time a message was received from the agent.
- **system.eam.runTask()**: Takes the name of a task as an argument as a string (must be configured on the Controller before hand), attempts to execute the task.

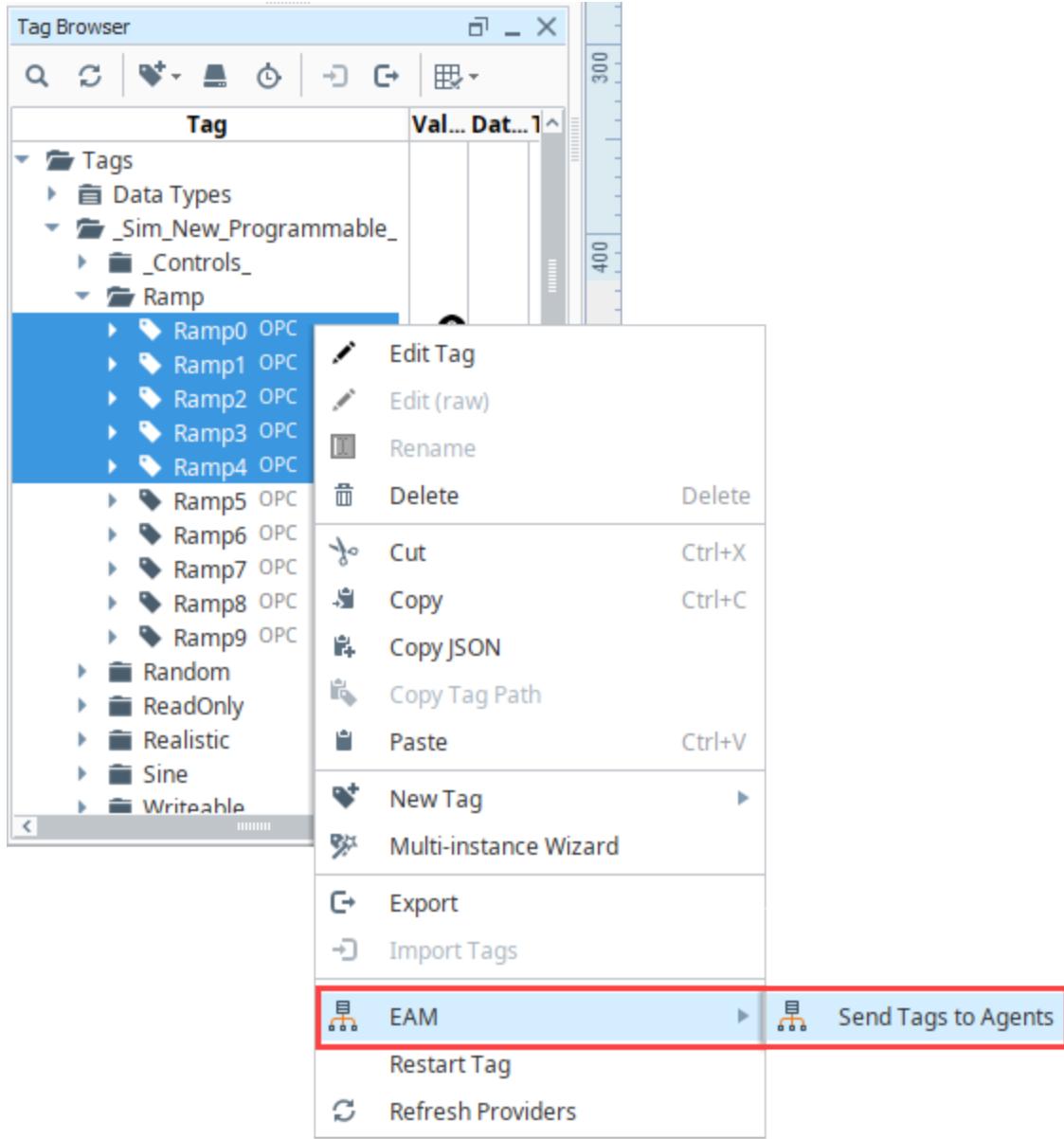
More details and examples can be found in the [system.eam](#) section of the [Appendix](#).



## Tag Distribution for Development Servers

With the EAM installed, you unlock more than just Agent tasks as a way to send data between gateways. When you are using a pair of servers for Development/Production, you can take advantage of the EAM to send Tags between Gateways much like you can send projects by using an Agent Task.

From your Controller, you can right-click on any Tag and send it to another Gateway in the Gateway Network. Since it is unlikely that you have identical PLC devices connected to multiple Ignition Gateways, this will only be useful for Development/Production server pairs or for memory Tags.



#### Related Topics ...

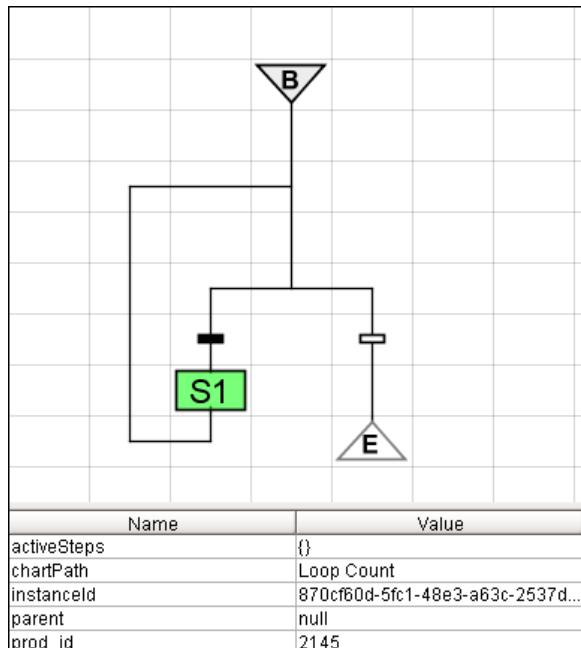
- Agent Tasks
- Tag Browser
- Property Binding Types
- Scripting Functions

# Sequential Function Charts

## What Are Sequential Function Charts?

A Sequential Function Chart (SFC) is a series of scripts that are defined in a single location, and then called in sequential order. Additional elements in the chart can determine where the flow of the chart will lead. Charts can loop around indefinitely, or execute a set number of times before ending. Sequential Function Charts are based on a graphical programming language in the IEC 61131-1 standard. This language may be familiar to PLC programmers, as it is one of the languages commonly available for programming PLCs.

SFCs are used to execute logic in ways that are more convenient to structure than with Python scripts or PLC programming alone. Because of their inherently visual depiction, they help to illuminate logic to users, and facilitate intuitive development and refinement. Charts can be monitored as they run visually, making troubleshooting easier than with scripting alone.



## On this page ...

- [What Are Sequential Function Charts?](#)
- [When Should I Use a Sequential Function Chart?](#)
- [How Do Sequential Function Charts Work?](#)
  - [Simple Visual interface](#)
  - [Chart Elements](#)
  - [Chart Flow](#)
  - [Monitor Chart Activity](#)
  - [SFC Redundancy](#)
- [Sequential Function Chart Architecture Examples](#)
  - [Simple Chart](#)
  - [Incorporate a Handshake](#)
  - [Parallel Processes and Flow Control](#)

## When Should I Use a Sequential Function Chart?

SFCs can be [used for many tasks](#), but they shine in the following conditions:

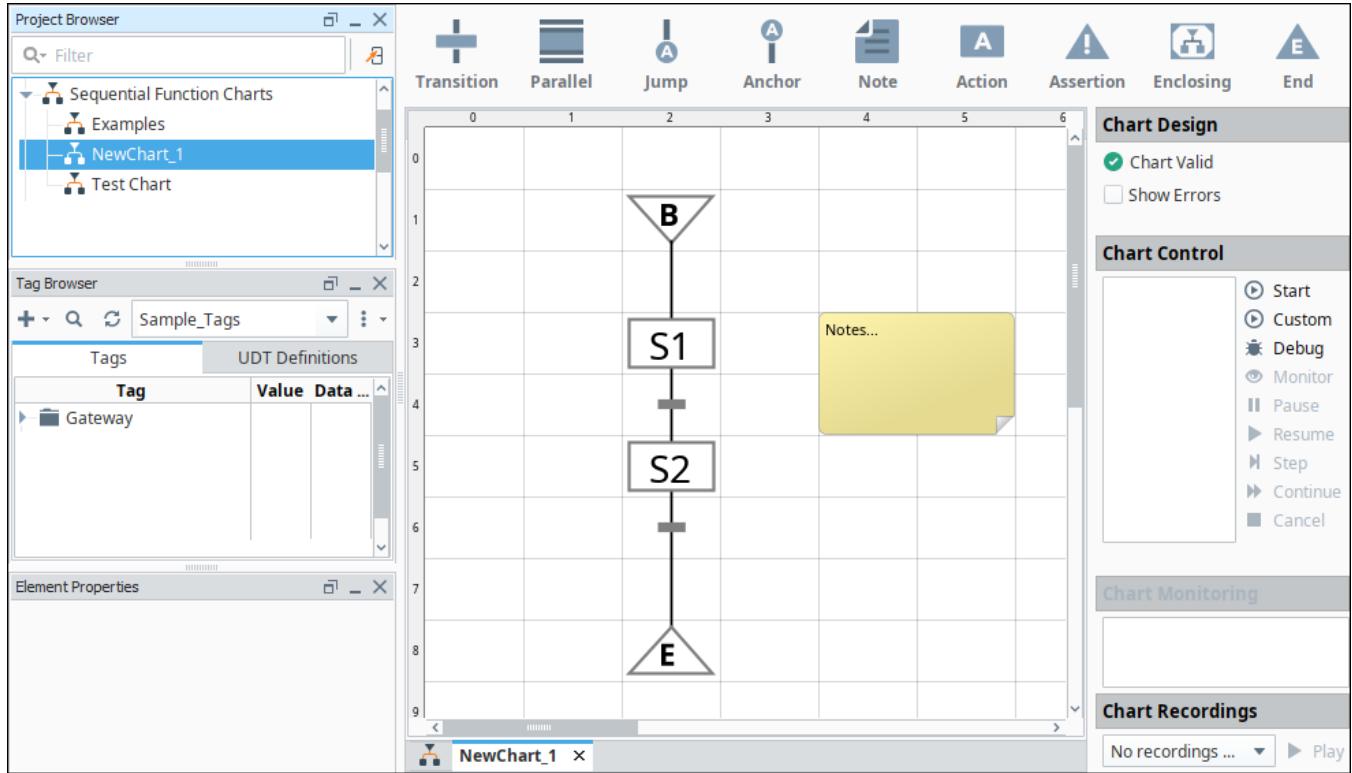
- **Situations where multiple processes need to run in parallel** - The nature of a chart allows for controlled execution. Pauses are handled by the chart, so there is no need to put threads to sleep.
- **When multiple processes must be completed in a specific order** - Charts always execute steps sequentially. A step will never become active out of order.
- **Complicated multi-step processes** - The nature of SFCs allows the user to visually build the work-flow of the chart, so troubleshooting is a breeze.
- **Linked processes** - In cases where several processes should **only** be called together. Scripts in a chart can only be invoked by the chart, so external scripts or resources will not be able to directly call the code from any of the steps.

## How Do Sequential Function Charts Work?

SFCs are built in the Designer, and executed on the Gateway, so they run independently of any Clients. They make use of both Python and Ignition's Expression language, so any number of tasks are possible from a single chart. A single SFC in Ignition can be called multiple times. Parameters can also be passed into a chart as it starts, so multiple instances can work on separate tasks individually.

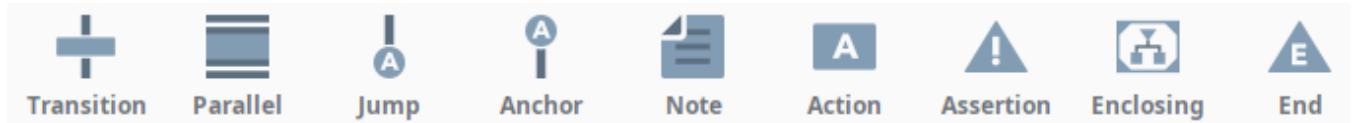
### Simple Visual interface

Charts elements are drag-and-drop, and work similarly to the components you are used to using in the rest of Ignition.



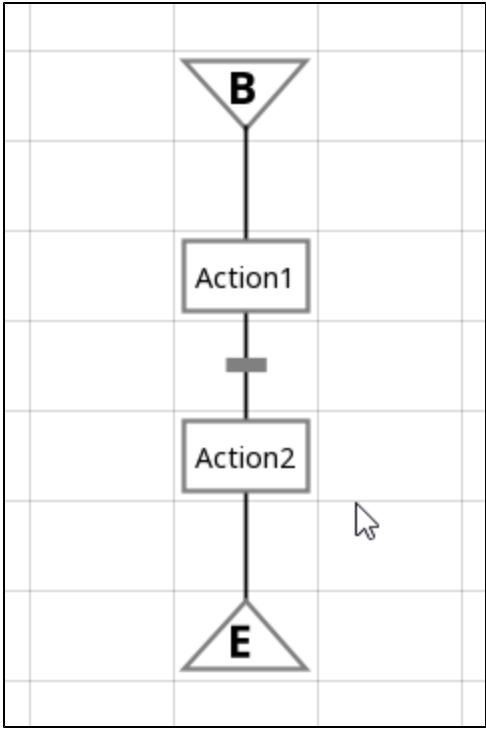
## Chart Elements

Charts are comprised of [elements](#), and these element perform the work in a SFC. Each element does something different, but they generally serve to either control the flow of the chart, or execute one or more Python scripts.



## Chart Flow

Charts always flow in the same way. They start at their begin step, and the logic of the chart typically flows from the top to the bottom, however charts are able to loop back to previous steps. Doing so allows for looping logic to be built directly into the chart. Flow of the chart can be halted by a transition element. The state of the transition can update in realtime, so a chart can pause until a user approves the chart to move on.



## Monitor Chart Activity

Simple HMI interfaces can be developed to [manage the SFC](#). An SFC can be started with a simple button or it can be managed with the [Vision - SFC Monitor](#) component.

**Project Browser**

- Windows
  - Main Window
  - Main Window2
  - Main Window3
  - PopupTest
- SFC
  - Root Container
    - SFC Monitor

**Vision Property Editor**

Common	
Name	SFC Monitor
Visible	<input checked="" type="checkbox"/> true
Border	Other Border
Data	
Instance ID	
Scope Dataset	<No Data>
Appearance	

Name	Value
activeSteps	{}
chartPath	Loop Count
instanceId	870cf60d-5fc1-48e3-a63c-2537d...
parent	null
prod_id	2145

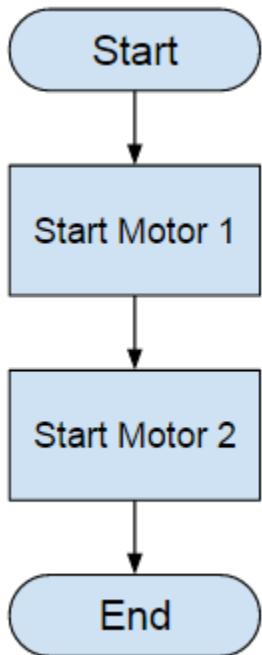
## SFC Redundancy

Sequential Function Charts support redundant Gateway clusters and will persist over gateway failovers using the [Redundancy Sync](#) property. A Backup Gateway will now pick up where the Master left off, or the chart can be [canceled, restarted, or even set to run at a different step](#).

## Sequential Function Chart Architecture Examples

### Simple Chart

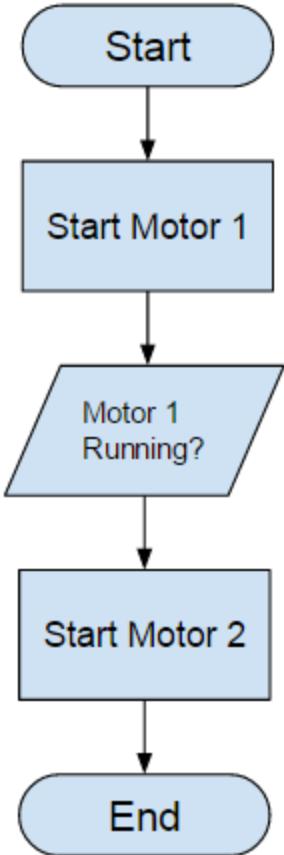
Performing multiple actions with a single call is easy to do with SFCs. Let us assume several motors all need to start from a single call. The work-flow would look like the following:



- The chart would **Start** and then move to the first motor.
- The **Start Motor 1** action would then run a script to start Motor 1.
- Once the script finishes, the chart then flows to **Start Motor 2**, and calls a script that would start Motor 2.
- When the second script finishes, the chart flows to the **End** step, and concludes the chart.

### Incorporate a Handshake

In many cases, a chart will need to wait for some other system to finish with a task before moving on. This is similar to receiving a handshake from the PLC before moving on. Charts can freely read and interact with the rest of Ignition, so a step in a chart can read a tag, run a query, make a web services call, read a local file, or do anything that is possible from a Python script. A chart could wait for a specific value on a tag, and then proceed after the value has met some set-point.

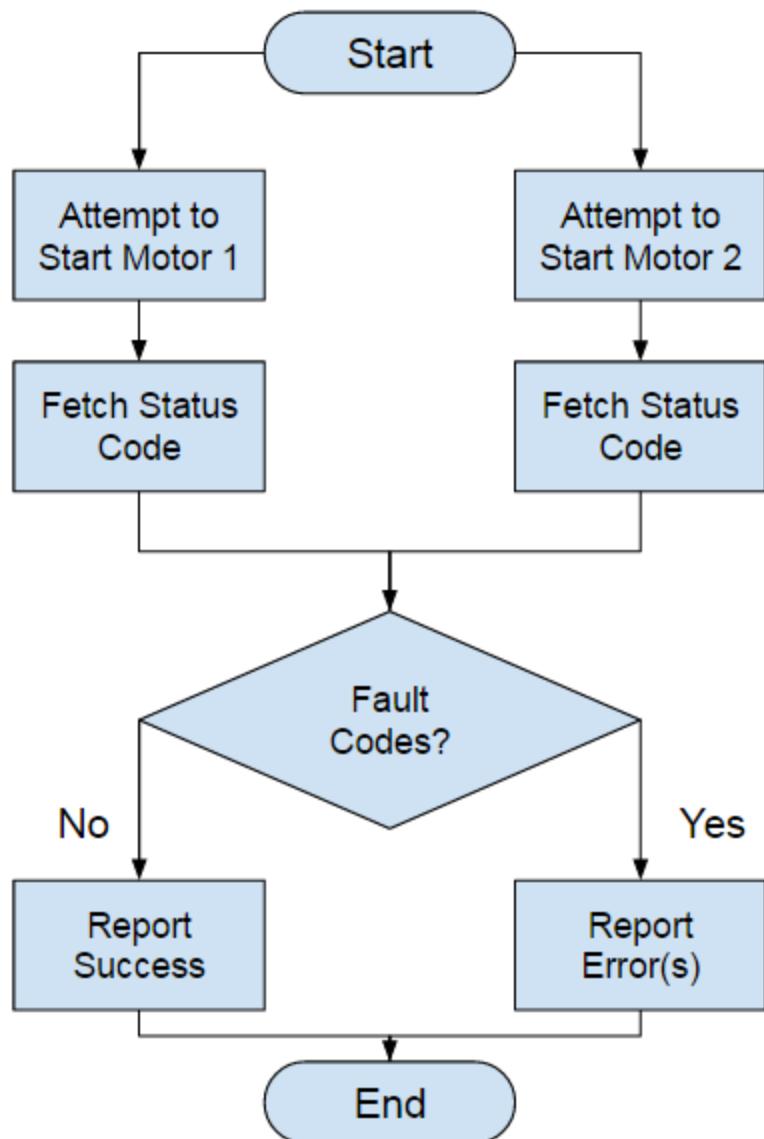


- **Start** the chart
- Run the script on **Start Motor 1**
- **Wait** until the PLC sets the value of a specific tag to a "Running" status code. All other scripts are on-hold while waiting.
- Run the script on **Start Motor 2**
- **End** the chart

## Parallel Processes and Flow Control

SFCs work great when multiple processes must run simultaneously. Transitioning from one step to another only occurs when the active step finish executing. This means multiple steps can execute in parallel, and later steps will not begin until all of the currently active steps have finished. This type of control is normally very difficult to accomplish with just Timer or Tag Change scripts because each script needs to be able to notify the other script once complete. SFCs allow the chart to monitor each step, and determine when it is time to move forward.

Charts can also make use of local parameters. After reading values from outside the chart, these values can be stored in a parameter on the chart. The value of these parameters can then be referenced by other elements, and the chart can decide where the flow should move towards.



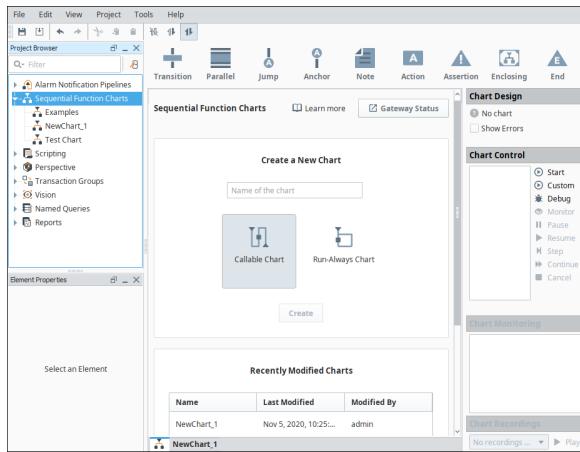
- **Start** the chart.
- Attempt to start both **Motor 1** and **Motor 2**.
- Check the **Status Code** from both motors. Pause all additional activity until a response code is retrieved from each motor.
- If **Fault Codes** were returned, then **Report the Errors**, otherwise **Report the Success**.
- **End** the chart.

In This Section ...

# SFC Designer Interface

The SFC module features a unique user interface within the Designer. For starters, the SFC Interface has a Welcome tab that allows you to create two types of charts: Callable and Run-Always. Each chart type is basically a template to help you get started creating your system function chart. Once you select a chart type, enter a name, and press 'create', and the specific chart template will open. You will have some of the necessary elements displayed in the chart workspace to begin designing your chart. The SFC Welcome tab will show you any recently modified charts along with the date it was modified and who modified it. You can even double click on a recently modified chart and open it.

The SFC Welcome tab provides a quick way to create new charts and update existing charts.

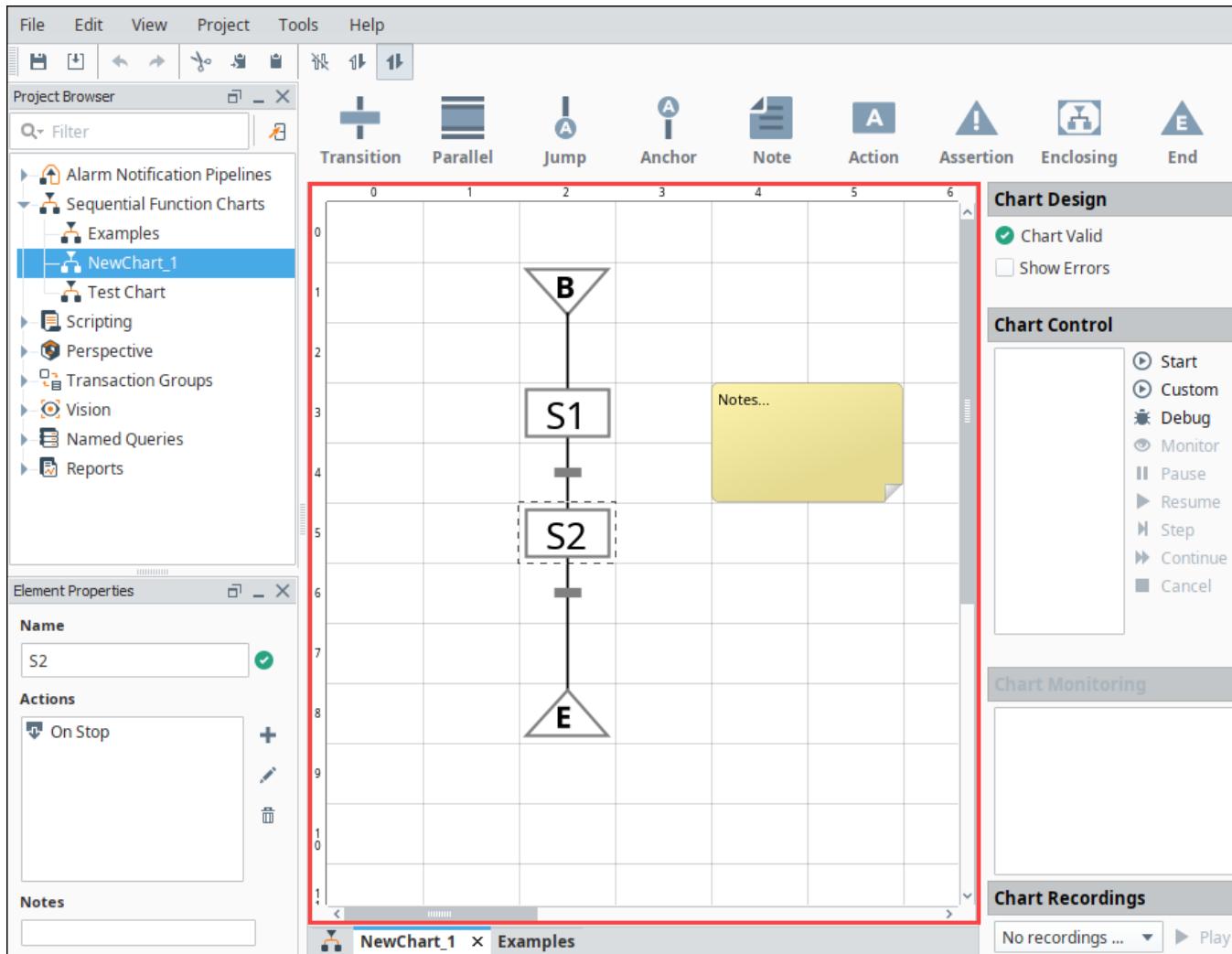


## On this page ...

- [Chart Workspace](#)
  - [Design View and Monitor View](#)
  - [Right-Click Menu](#)
- [Element Blocks](#)
- [Element Properties](#)
- [Chart Design](#)
- [Chart Control](#)
- [Chart Monitoring](#)
- [Chart Recording](#)
- [Gateway Settings](#)

## Chart Workspace

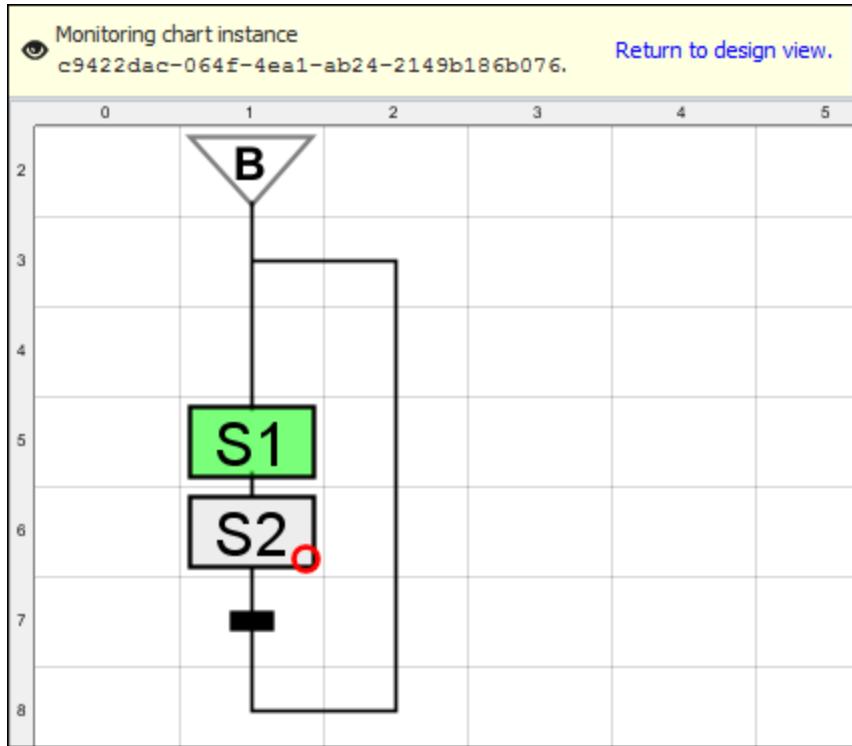
The main workspace of a chart features a grid, and is where your elements will be placed and selected.



## Design View and Monitor View

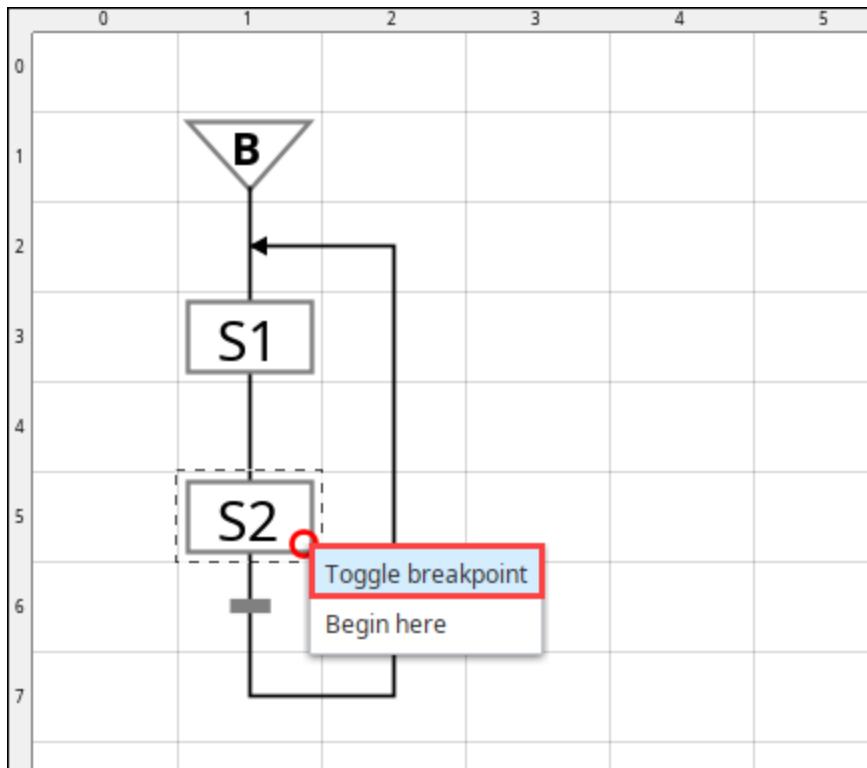
Initially the SFC interface is in **Design View**, which means new elements can be added, repositioned, or edited. This is similar to the Design Mode in the Vision module.

When monitoring charts, the interface switches to **Monitor View**, allowing the Designer to view the current state of any running charts. You may switch into Monitor View by double-clicking a chart in the Chart Control list, or by selecting a chart and clicking the **Monitor** icon. Once ready to make changes, the "Return to design view" link will revert the workspace back to Design View.



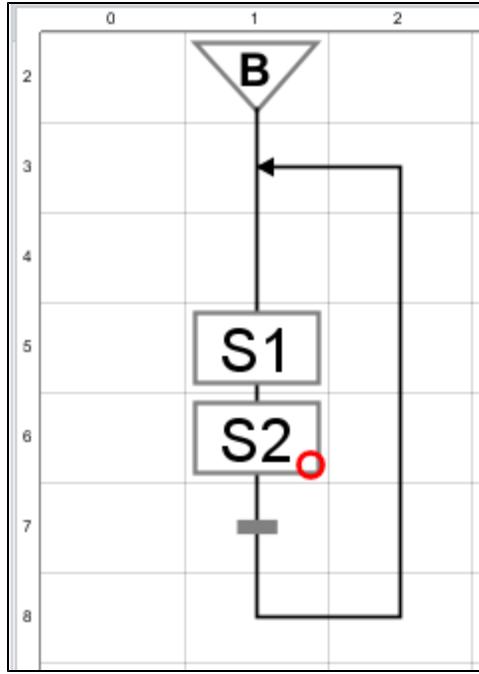
## Right-Click Menu

When right-clicking on an Action, Assertion, Begin, End, or Enclosing block, a popup menu will appear with the following options



## Toggle Breakpoint

Applies a breakpoint to a block, which will pause the chart when flow reaches the block in **Debug Mode**. Below we see that the S2 element has a breakpoint applied

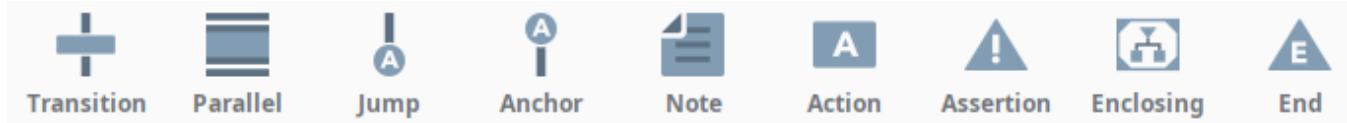


## Begin Here

Starts a new instance of the chart at the specified element. This is similar to using the **Custom** icon under Chart Control, in that you can potentially set the value for any parameters.

## Element Blocks

Provides a single location to drag and drop elements into the chart. The various blocks are listed under the [SFC Elements](#) page.



## Element Properties

This panel provides a way to interact with selected elements. The contents of the panel change based on which element is selected. See [SFC Elements](#) for more details.

**Element Properties**

Name
X

**S1**

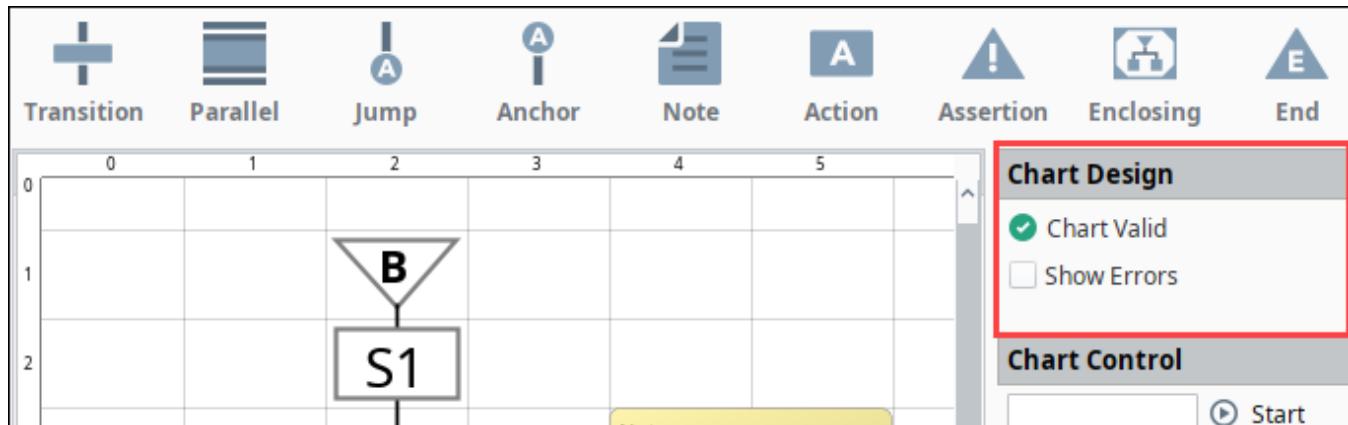
**Actions**

- On Start
- Error Handler

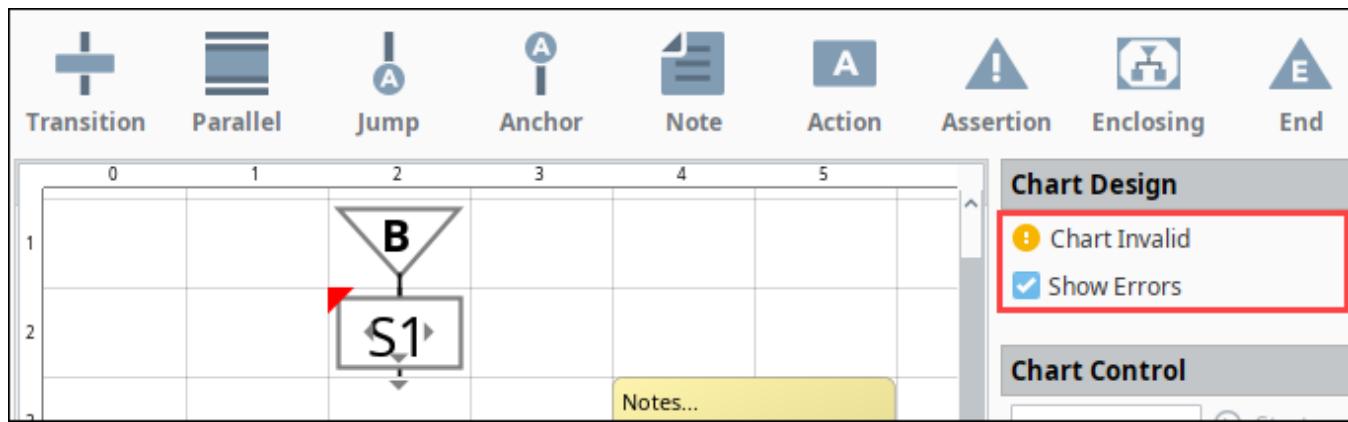
**Notes**

## Chart Design

This section of the interface provides helpful diagnostic information. The section will state if a chart is valid.



In the following example, the link after S1 is broken. You'll notice a **Chart Invalid** ! icon appears. And if you click the **Show Errors** checkbox, the error is annotated with a red triangle in the chart.



## Chart Control

The Chart Control section allows you to Start or Stop charts, as well as view any running charts.

The screenshot shows the 'Chart Control' window. On the left is a list of charts with their status, ID, and creation time. The first chart is 'Paused 00:02:20' with ID 'f0fd6714-9044-43c2-8007-babfd65e8041'. The second chart is 'Running 00:00:31' with ID '368c95e9-265f-4608-918c-95e15bae8398'. The third chart is 'Canceled 00:00:04' with ID '930359e7-66b2-48b9-8e0a-fc6a87fec9f3'. This list is highlighted with a blue border. On the right is a sidebar with control buttons: Start (radio button), Custom, Debug, Monitor, Pause, Resume, Step, Continue, and Cancel.

Chart Control has the added feature of displaying information about any running charts, including the current state, duration, and instance id. Double clicking on a chart in the list will cause the interface to monitor the chart, similar to clicking on the **Monitor** link.

Icon	Description
Start	Start the chart that is currently viewable in the main workspace (selected tab at the bottom of the workspace).
Custom	Starts the current chart, but allows you to manually pass values into any chart parameters.
Debug	Starts the current chart, but stops at the first breakpoint. Allowing you to examine properties on the chart.
Monitor	Switches from Design View to Monitor View, allowing you to monitor a running chart.
Pause	Pause a running chart, allowing you to later resume the chart.
Resume	Resumes a previously paused chart.
Step	While halted at a breakpoint, moves the chart towards the next step. This icon is only available in Debug Mode.
Continue	Continue and break at the next defined breakpoint. This icon is only available in Debug Mode.
Cancel	Cancels the selected chart.

## Chart Monitoring

This section is inactive in Design View, but becomes active while in Monitor View. Displays any properties associated with the running chart.

Chart Monitoring	
Name	Value
<b>Chart Scope</b>	
activeSteps	{}
chartPath	New Chart
count	15009
instanceId	c9422dac-064f-4ea1-ab24-2149b186b076
parent	null
runningTime	1556
startTime	Tue Aug 07 15:05:51 PDT 2018

## Chart Recording

This section populates with past chart executions, and allows you to replay them from the Monitor View. Only recordings that have finished running may be examined. By default, chart recordings are disabled. You can enable recordings in the Gateway settings.

## Gateway Settings

There are several settings on the Gateway that impact chart recording for SFCs. By default, chart recordings are disabled. You can enable recordings in the Gateway **Config** section under **Sequential Function Charts > Settings**.

Chart Recording	
Chart Recording Enabled	When enabled, every detail of chart execution is recorded on disk, to aid in later analysis and debugging. Default is false.
Recordings Per Chart	The maximum number of recordings stored for each chart. Default is 5.
Prune Age	The maximum age of recordings stored on disk. Recordings will be deleted after this point.
Prune Age Units	Unit of time for the prune age. Options are: Milliseconds, Seconds, Minutes, Hours, Days, Weeks, Months, and Years. Default is Day.

**Chart Recording**

**Chart Recording Enabled**  When enabled, every detail of chart execution is recorded on disk, to aid in later analysis and debugging.  
(default: false)

**Recordings Per Chart**   
The maximum number of recordings stored for each chart.  
(default: 5)

**Prune Age**   
The maximum age of recordings stored on disk. Recordings will be deleted after this point.  
(default: 7)

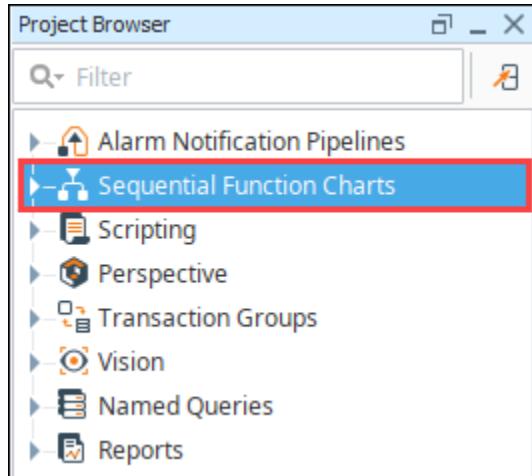
**Prune Age Units**  ▾  
(default: DAY)

**Save Changes**

# SFC Basics

## Architecture

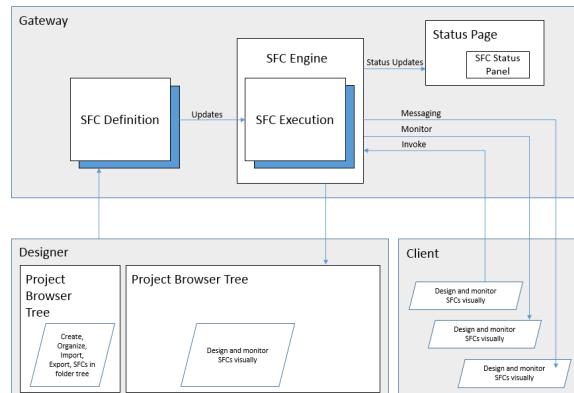
Sequential Function Charts (SFC) are designed through drag-and-drop manipulation in the Designer. The charts are located in a folder in the Designer's Project Browser. Charts are not part of any specific project; they are shared by all projects.



SFCs are executed in the Gateway. While any scope (Client, Designer, or Gateway) can start a new chart instance, the chart instance always executes in the Gateway.

SFC instances can be monitored in either the Client or the Designer. To monitor a running chart instance in the Designer, you can open that chart in the SFC workspace and double-click on the running instance. To monitor a running chart in the Client, a Vision project must be designed that uses the SFC module's monitoring panel component.

## SFC Execution in Gateway



## Run Modes

Each sequential function chart can be configured to use one of the following **Execution Modes**:

- **Callable**  
This chart can be started via scripting or another chart's enclosing step on-demand. Any number of instances of this chart can be simultaneously running.
- **RunAlways**  
This chart can be started by the Gateway upon startup. It can not be executed in any other way. It is probable that this chart be designed to never end, the idea being that there will always be exactly one instance of this chart running.
- **Disabled**  
This chart is not available for execution.

## On this page ...

- Architecture
  - SFC Execution in Gateway
  - Run Modes
  - Steps
  - Designing Charts
  - Chart Instance
  - Scripting Reference



## Introduction to Sequential Function Charts

[Watch the Video](#)

## Steps

Steps are the parts of the chart that do useful work. Steps are represented as a rectangle that occupies a one-cell region of the chart, except for the begin and end steps, which are triangles. Steps might run scripts, or execute other charts depending on how you set them up.

There are four types of steps:

- Begin and End Steps
- Action Step
- Assertion Step
- Enclosing Step

In addition to these, there are multiple [SFC elements](#) that allow for more complex logic in your SFC.

## Designing Charts

Before a chart is executed, it must have a correct structure. When designing a chart, the Designer will constantly let you know whether or not your chart is valid. If your chart is not valid, you may choose to show the errors. The error shows up as red triangles in the corner of any element which has a problem. Hover your mouse over these elements to discover what is wrong with them.

Here are some rules about structure to keep in mind:

- Everything must be fully connected (except for Notes).
- Flow typically moves from top to bottom. All elements must be entered from the top and exit from the bottom (not the sides).
- There can be any number of end steps. If flow reaches an end step, the chart is stopped. If there are no end steps, it means that your chart must loop back upon itself to satisfy the connected rule.
- End steps are not allowed inside parallel sections.



### Designing Charts

[Watch the Video](#)

## Chart Instance

Each chart you define in the Designer may be invoked multiple times, and each invocation will start a new instance of that chart. The instances may be started with different starting parameters which affect how the chart works. Each instance runs completely independently of the other instances. The ability to have multiple instances of a chart is one important feature that makes SFCs within Ignition different than SFCs inside of PLCs.

## Scripting Reference

For information about the scripting API methods available for sequential function charts, see [Scripting Functions](#).

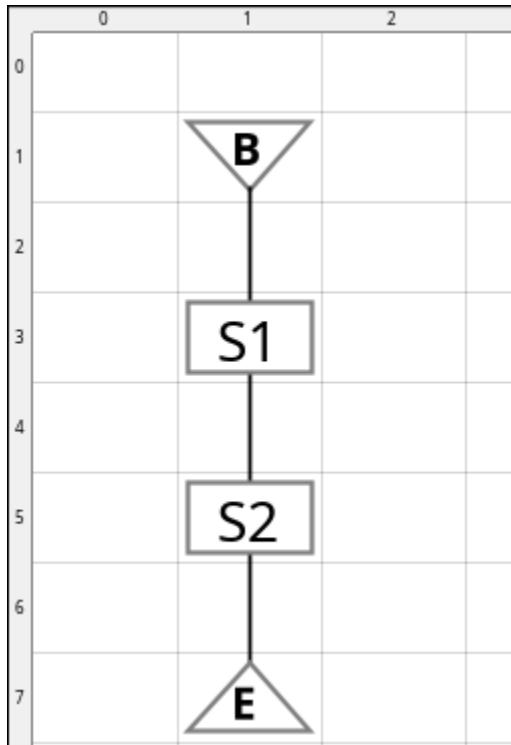
[In This Section ...](#)

# Chart Flow and Rules

## Understanding Flow

Similar to how water flows down a river, execution of an SFC chart flows along one or more paths. When a chart is running, flow typically moves from top-to-bottom. To reinforce this concept, begin steps only flow down, and end steps only accept flow from the top.

In the following chart, execution begins at the Begin Step (**B**), flows down into the first Action Step (**S1**), flows into the next Action Step (**S2**), and then into the End Step (**E**).



## Vertical Movement

While charts generally flow from top-to-bottom, they can advance bottom-to-top. This allows for looping logic to be built directly into the chart: the chart will loop around until something either redirects the flow, or cancels the chart.

In the image below, the chart will flow out from the bottom of **S2**, travel up, and loop back around to the top of **S1**. The chart will continue looping around until canceled.

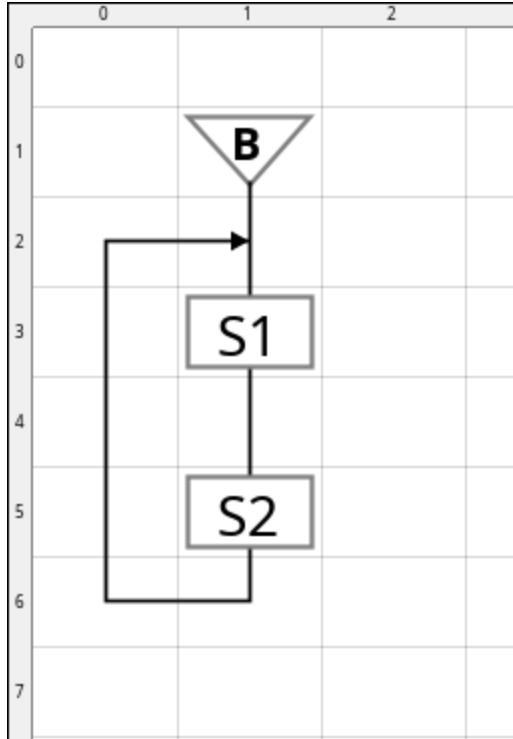
## On this page ...

- Understanding Flow
  - Vertical Movement
  - Determining when to Proceed
  - Directing Flow
- Chart Rules
  - Flow Must Always Lead into the Top of an Element
  - All Elements Must Be Connected to the Chart
  - All Links Must Lead to an Element
  - Flow May Not Lead into Multiple Actions
  - Charts Do Not Need an End Step
- Chart Lifecycle
  - Active States
  - Terminal and Intermediary States



## Chart Flow Steps and Transitions

[Watch the Video](#)



## Determining when to Proceed

Before flow may exit from an Action, the following requirements must be met:

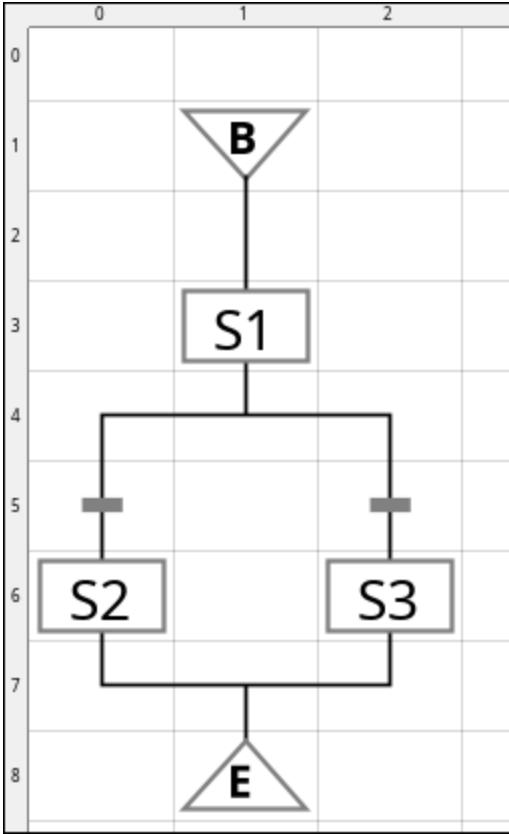
- **A sequential step must be available.** Flow of the chart must be able to reach a step, such as another Action Step, or an End Step. Transitions are generally used to control the availability of steps.
- **The active step must be ready to finish.** Action steps may have a script running when the next Transition opens or returns "true". As soon as an available path is ready, the step will finish any running scripts, and then flow will move on. In situations where a script may take a long time to finish, this waiting prevents partial execution, and guarantees that any attached scripts will be allowed to finish.

Once both condition are true, flow continues.

## Directing Flow

After exiting an element, flow of the chart may branch off into multiple potential paths. When multiple paths are present, the chart will choose a single element. Transitions are used to help coerce flow of the chart when multiple paths are available. When the expression on a transition resolves as true, flow may proceed through. When a transition resolves as false, flow is halted.

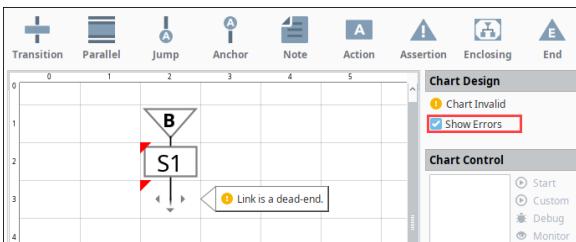
In cases where multiple open transitions are present, flow is biased towards the left-most path. In the image below, flow exits from **S1**, and has two possible paths. When both transitions are true, flow will always take the left path, so **S2** would execute next. In this scenario, **S3** would be ignored.



In most cases, transitions will not statically be set to a true value. By implementing more meaningful expressions on the transitions, the chart can determine which path to take while running. Furthermore, as long as both transitions are false, flow of the chart will be blocked, waiting for one of the transitions to become true. This structure is very similar to a logical OR: if either Transition is true, flow will continue.

## Chart Rules

When developing a chart, there are several rules to keep in mind. Violating some of these rules will result in compilation errors on the chart. The Designer's interface will report any chart errors in the Chart Design section. When enabled, the **Show Errors** checkbox will highlight problem areas on the chart, as well as show the error when the mouse cursor is moved on top of the problematic area.



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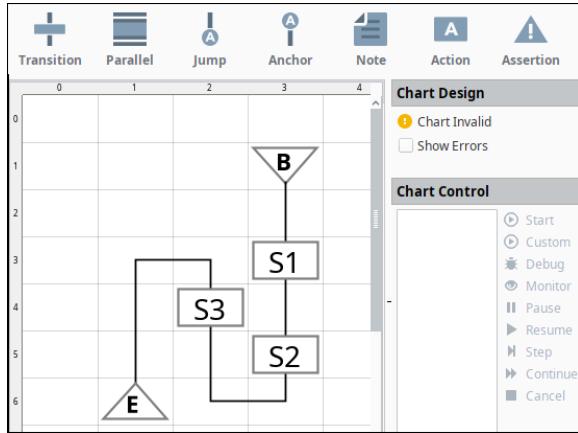
**Chart Rules**

[Watch the Video](#)

## Flow Must Always Lead into the Top of an Element

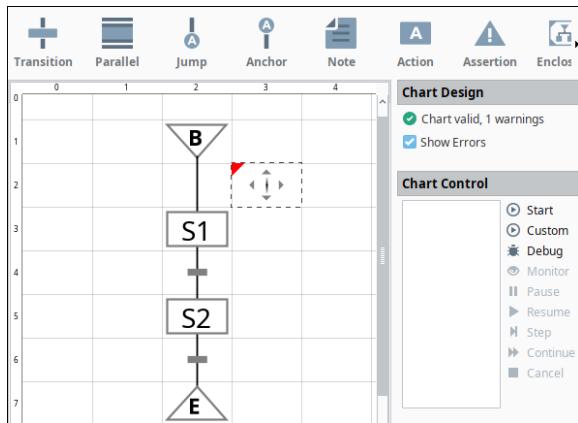
While moving bottom-to-top is legal, flow may never enter the bottom of an element. If the flow leads to the bottom of an element, it is considered a dead-end, and the chart will fail to execute.

The image below demonstrates an **illegal** chart. This chart will not execute because the flow from **S2** is attempting to lead into the bottom of **S3**.



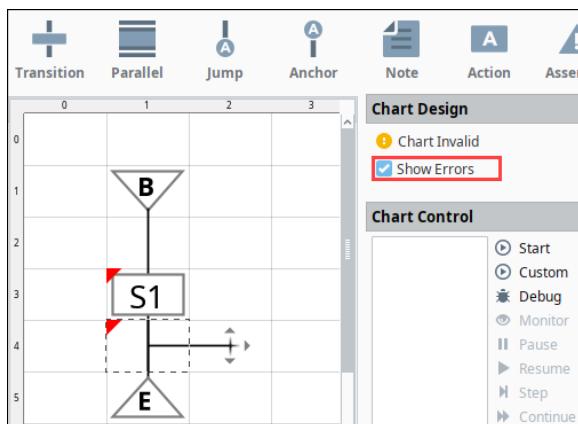
## All Elements Must Be Connected to the Chart

Every element present should be linked to other elements in the chart. Rogue elements should be removed before the chart runs.

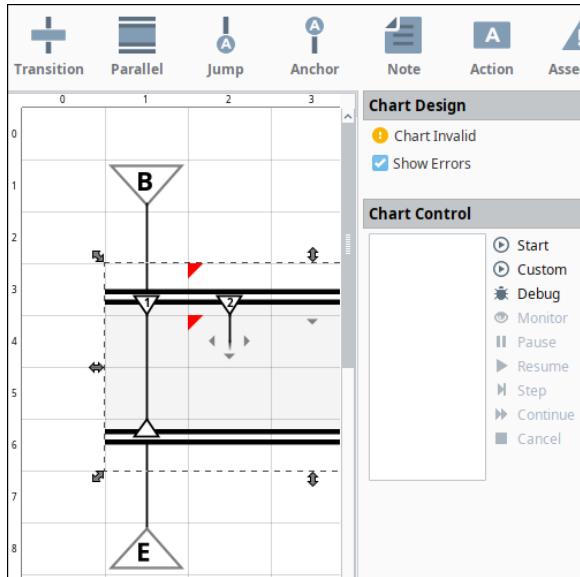


## All Links Must Lead to an Element

Links must connect to an element. Any link that is not connected is considered a dead-end, and must be removed.

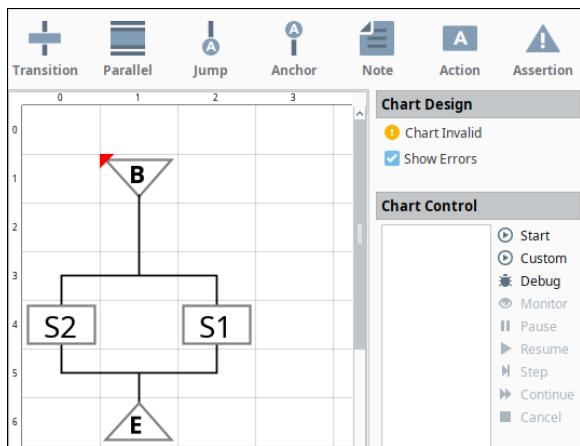


This rule extends to links created inside of a Parallel element.



## Flow May Not Lead into Multiple Actions

Outside of a Parallel element, only a single action should run at any time. Flow that leads into multiple actions will cause a compilation error because the chart does not know which action to run. In cases where the chart flows into multiple Actions, transitions should be used to guide the flow. If multiple actions must execute simultaneously, a parallel element should be used.



## Charts Do Not Need an End Step

Flow of the chart must always lead somewhere, but an End Step does not have to be used. Charts can freely loop around indefinitely. If flow is blocked by a Transition, then the chart is effectively awaiting input to execute.

## Chart Lifecycle

Each running chart is effectively a finite-state machine: the chart can be in one of many different states, but it is only ever in a single state at any given moment. The current state of the chart carries significant meaning.

The figure below shows each potential state a chart can be in, and outlines which states are accessible from each other state.

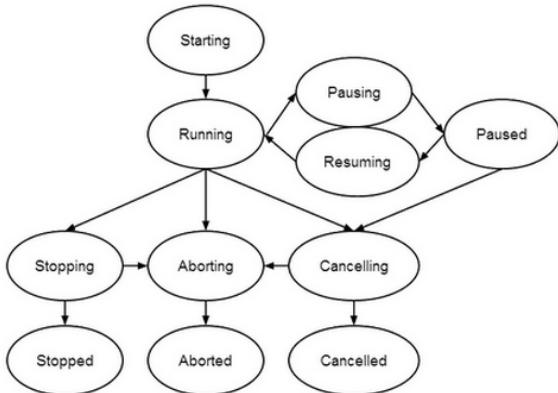


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**Chart Lifecycle**

[Watch the Video](#)



## Active States

The following states are common to the lifecycle of a running chart.

State	Description
Starting	The chart begins. The <a href="#">On Start Event Script</a> triggers at this point.
Running	The chart flows through its structure. Running charts generally spend most of their time in this state.
Pausing	When the chart is requested to pause, it moves into this transitional state. The chart will attempt to finish execution on all active scripts, and will not start any additional scripts.  Once all scripts have successfully finished, the chart will transition to the Paused state. Charts may be paused from either the chart Control section of the Designer, or by calling <a href="#">system.sfc.pauseChart</a> .
Paused	The chart will sit here indefinitely until requested to resume, or is canceled. This is an idle state where the chart does not take any actions unless requested to do so.
Resuming	Once requested, the chart will start up and briefly enter this state. Resuming a chart can be done from the Chart Control section of the Designer, or by calling <a href="#">system.sfc.resumeChart</a> .

## Terminal and Intermediary States

Charts have three different terminal states, or end states. **Terminal states** denote that the chart has ended due to some reason. There are also three intermediary states that lead to the terminal states. When a chart ends in some way, the chart transitions to an **intermediary state** before moving to the associated terminal state. This allows the chart a chance to do some closing work before ending. The intermediary states are as follows:

State	Description
Stopping	The chart has reached an End Step, and will stop soon. In most cases, this is the preferred terminal state as the chart successfully reached its end. The <a href="#">On Stop Event Script</a> will trigger at this state. Once finished, the chart will transition to the <b>Stopped</b> state.
Aborting	The chart has encountered some sort of error, and must end abnormally. The <a href="#">On Abort Event Script</a> will trigger. Once On Abort ends, the chart will transition to an <b>Aborted</b> state.
Cancelling	Something requested the chart to cancel, or end before reaching the End Step. The <a href="#">On Cancel Event Script</a> will trigger, and the chart will transition to a <b>Cancelled</b> state. Cancelling can occur from the Chart Control section of the Designer, or by calling <a href="#">system.sfc.cancelChart</a> .

All three terminal states essentially mean the same thing for the chart: the instance will no longer run. The differences is how the chart ended. When troubleshooting, it is helpful to know why a chart ended; did it finish successfully, was there an error that prematurely ended the chart, or did something request that the chart stop?

Understanding how the chart ends can greatly aid in tracking down any problems. To that end, it is highly recommended to place scripts on the **On Abort** event. This will clearly log when a chart failed.

**Related Topics ...**

- [Chart Scope and Variables](#)
- [SFC Elements](#)

# Chart Scope and Variables

## Chart-Scope Variables

Charts can have variables created within them. The term “scope” means a collection of named variables that are accessible to the elements of a chart. Each chart instance gets its own, private scope. Scopes are basically free-form name-value maps, whose values may be any Python object, including scalar and multivariate types.

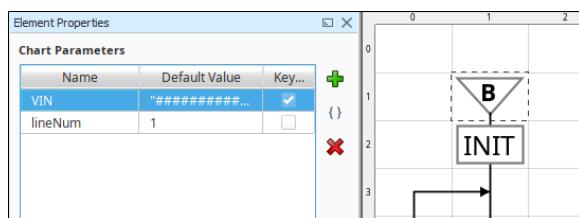
Each chart gets a scope object that can be accessed from all steps and transitions within that chart. When starting a chart (for example, from a script), you’ll be able to pass variables to the chart: those variables will appear in the chart’s scope.

By defining a variable as chart-scoped, all of the scripts and expressions in the chart may access the variable. Variables that will be referenced by multiple elements should be made chart-scoped.

## Chart Parameters

The Begin Step of a chart allows chart parameters to be defined. Chart Parameters are chart-scoped variables that the chart expects to be initialized with. Values may be defined for each parameter, but can be overridden when a chart is called, or starts. If the parameter values are override, then the initial values will be ignored.

One of the chart parameters defined on the begin step may be marked as the **Key Param**. This means that this parameter may be used as an identifier for the chart. For example, suppose your chart defined the automation process for a car through an assembly line. You might define the car’s VIN as the key param. This means that instances of this chart may be identified by the VIN they were started with.



## Defining Variables in Actions

Chart-scoped variables may also be defined on Action Steps in a chart. To define a chart-scoped variable, “chart.” should be prepended before the variable name. Creating a variable called “partNumber” on an Action Step’s **On Start** would use the following syntax:

```
chart.partNumber = 111
```

As long as the name of the variable matches a pre-existing variable, then the new value will be assigned. If a script on an Action attempts to reference a variable that has not yet been defined, the script will create it.

## Built-in Variables

There are a number of built-in variables maintained by the SFC engine that can be read through the chart scope.

SFC Built-in Variable	Description
chart.instanceId	The string UUID of the running chart instance.
chart.startTime	A <code>java.util.Date</code> object that indicates when the chart instance started running.
chart.runningTime	An integer representing the number of seconds the chart has been running for.
chart.parent	The chart scope of the enclosing chart (if any). Value is null if this chart was not executed as part of an enclosing step.
chart.running	Returns true if the chart is in the running state.

## On this page ...

- [Chart-Scope Variables](#)
  - [Chart Parameters](#)
  - [Defining Variables in Actions](#)
  - [Built-in Variables](#)
  - [Reserved Words](#)
  - [Chart-Scope Variables in Transitions](#)
- [Chart Monitoring](#)



## Chart Scope

[Watch the Video](#)

chart.state	An integer representing the state of the chart as the following:																										
	<table border="1"> <thead> <tr> <th>Value</th><th>State</th></tr> </thead> <tbody> <tr><td>0</td><td>Aborted</td></tr> <tr><td>1</td><td>Aborting</td></tr> <tr><td>2</td><td>Cancelled</td></tr> <tr><td>3</td><td>Canceling</td></tr> <tr><td>4</td><td>Initial</td></tr> <tr><td>5</td><td>Paused</td></tr> <tr><td>6</td><td>Pausing</td></tr> <tr><td>7</td><td>Resuming</td></tr> <tr><td>8</td><td>Running</td></tr> <tr><td>9</td><td>Starting</td></tr> <tr><td>10</td><td>Stopped</td></tr> <tr><td>11</td><td>Stopping</td></tr> </tbody> </table>	Value	State	0	Aborted	1	Aborting	2	Cancelled	3	Canceling	4	Initial	5	Paused	6	Pausing	7	Resuming	8	Running	9	Starting	10	Stopped	11	Stopping
Value	State																										
0	Aborted																										
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5	Paused																										
6	Pausing																										
7	Resuming																										
8	Running																										
9	Starting																										
10	Stopped																										
11	Stopping																										
chart.abortCause	Should the chart abort, returns the exception. Only available on the chart's <b>On Abort</b> event script.																										

## Reserved Words

Certain chart-scoped variables may interfere with the internal functions of the chart. For example, creating a variable like chart.values will conflict with a Python dictionary's values() method and therefore the chart will show an error. Since SFCs use Python dictionaries to manage chart-scoped variables the methods associated with Python dictionary's act like reserved words.

In addition to the built-in variables above, the following names should be avoided when declaring chart or step variables:

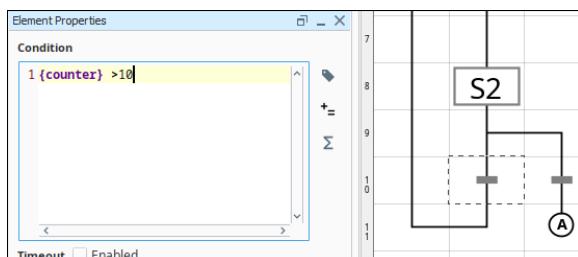
clear	copy	fromkeys	get	has_key
items	keys	setdefault	update	values

## Chart-Scoped Variables in Transitions

Because transitions use Ignition's Expression Language, referenced chart-scoped variables use different syntax. Chart-scoped variables can be denoted by typing the name of the variable between the "{" and "}" characters. The "partNumber" variable from above would look like the following:

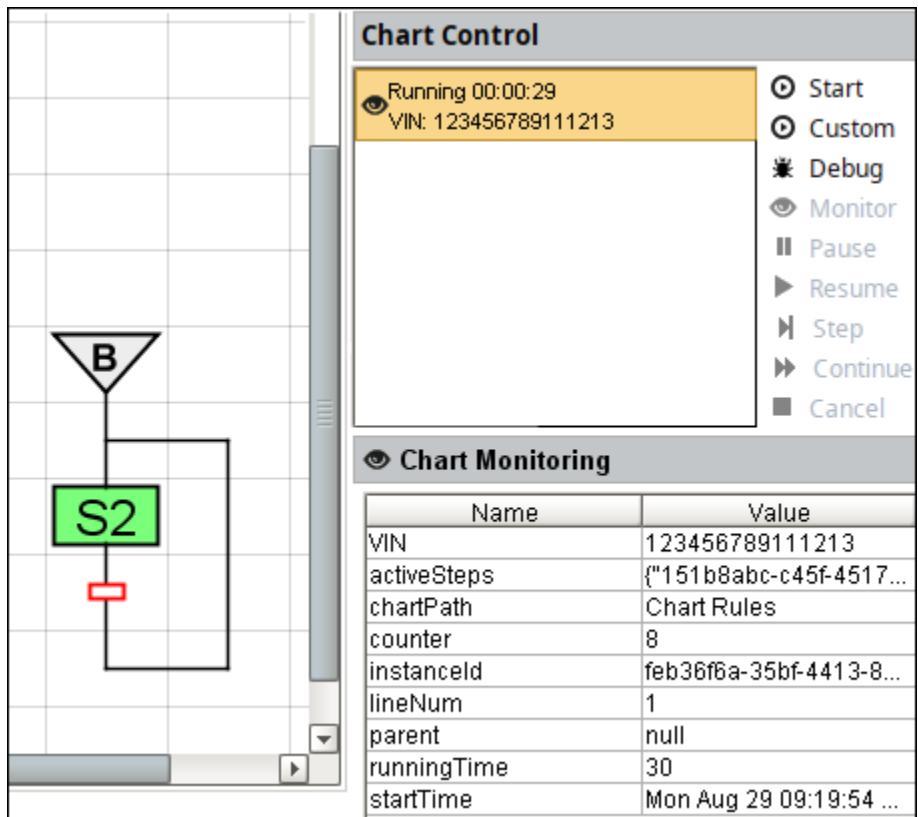
```
{partNumber}
```

Referencing chart-scoped variables in Transitions allows you to easily control the flow of a chart. This is commonly used to create a **{counter}** that blocks flow of the chart until a certain condition has been met.



## Chart Monitoring

Once chart-scoped variables have been defined, their values can be viewed while the chart is running in the Chart Monitoring section. This allows for easy troubleshooting from the Designer. More details can be found on the [Monitoring and Debugging Charts](#) page.



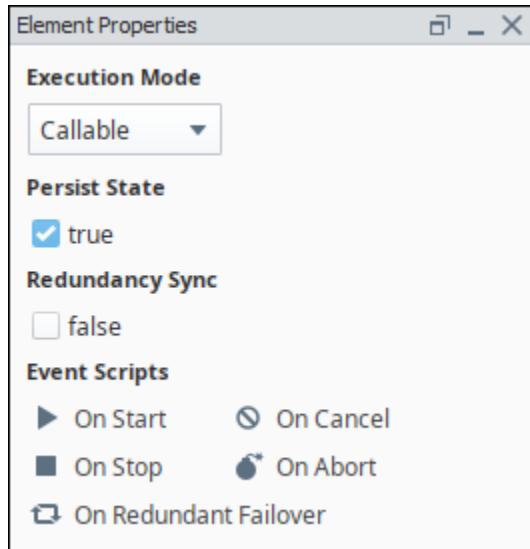
[Related Topics ...](#)

- [Chart Properties](#)

# Chart Properties

## Properties on a Chart

Much like properties on a [Vision](#) window, charts have properties that drastically modify their behavior. These properties will appear in the Element Properties panel when clicking on the background of a chart.



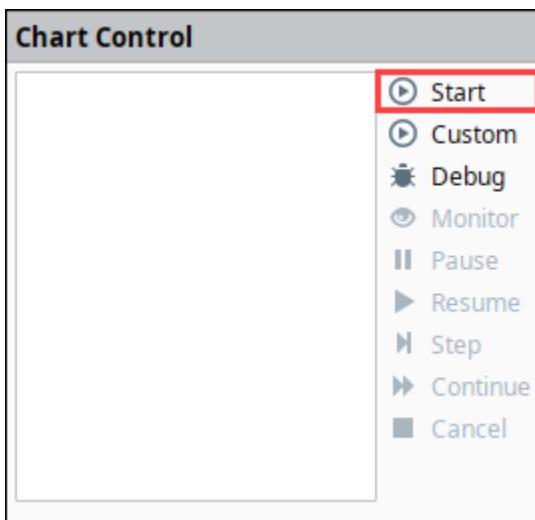
### Execution Mode

This property determines how and when the chart should run.

#### Callable

Callable charts must be called before running. Any number of instances may run simultaneously. There are several ways to invoke a Callable chart:

- **Scripting** - `system.sfc.startChart` will invoke an instance of the chart.
- **Enclosing Step** - Charts using an Enclosing Step may call another chart.
- **Designer** - While viewing the chart in the Designer, chart instances may be called from the Chart Control panel by clicking the **Start** link.



#### RunAlways

## On this page ...

- [Properties on a Chart](#)
- [Execution Mode](#)
  - [Callable](#)
  - [RunAlways](#)
  - [Disabled](#)
- [Persist State](#)
- [Redundancy Sync](#)
- [Event Scripts](#)



### Chart Properties

[Watch the Video](#)

The chart will be initiated by the Gateway upon startup. It can not be executed in any other way. It is probable that this chart will be designed to never end, the idea being that there will always be exactly one instance of this chart running.

If the chart is aborted, canceled, or flow leads into an End Step, a new instance of the chart will not be called. Because of this, it is recommended to test your charts with the Callable execution mode, and design the Chart with a looping structure in mind.

## Disabled

Disables the chart. This mode is great when a chart should be "shut off", such as when maintenance is working on a machine. Instances of the chart can not be called while set to **Disabled**.

## Persist State

If enabled, each running chart will save its state when the Gateway is shut down. Prior to shutting down, the Gateway will record the state of each persistent chart to a file in Ignition's installation directory. Once the Gateway comes back online, the Gateway will read this file, and the chart will resume from where it left off. Values of each chart-scoped variable will be maintained between restarts.

Because the state is recorded on shutdown, all of the following conditions must be true for the state to be preserved:

- The Gateway has time to record the state before the operating system terminates the process.
- The chart is between script executions.

In the case of an expected shutdown (the operating system was requested to restart), all running scripts need to stop in a timely manner for the record to be taken, otherwise the operating system may force the Gateway to stop before the record is taken. It is recommended to design your chart in a manner that can easily be paused. This is usually accomplished by breaking up tasks into multiple smaller scripts. More details can be found on the [Action Step Best Practices](#) page.

In the event of unexpected shutdown, such as power to the server was cut-out, then the state will not be properly recorded. However, [Ignition Redundancy](#) can be used to protect against unexpected shutdowns.

## Redundancy Sync

When enabled, the chart state and parameters will be synchronized across a redundant cluster, allowing a backup node to continue after chart execution. This can continue where the chart left off in the master, or the On Redundant Failover function can be used to restart, modify, or cancel the charts execution within the backup.

Synchronization only occurs when starting a new step. This means that any long running steps that updates variables multiple times throughout its execution will not be properly synced, and the variables will be out of date when starting at that step. The `system.sfc.redundantCheckpoint` function can create a "checkpoint" in the step execution, allowing you to manually sync the steps variables to the same step on the redundant node. The function can be used multiple times throughout a step, depending how long the step takes to execute, and how often values are updated.

## Event Scripts

Similar in concept to Event Handlers on Vision components, Event Scripts trigger when certain actions occur in a running chart. The following events are available:

Event Name	Description
On Start	This will run once when the chart is started.
On Stop	This will run once when the chart is stopped normally. Specifically, when flow leads into an End Step.
On Cancel	This will run once if the chart is cancelled.
On Abort	This will run once if the chart is aborted. This occurs when an error in a script causes the whole chart to fail. If the script on this event fails, a log message will appear in the Gateway console. The exception that caused the abort is available via <code>chart.abortCause</code>

**Example - `chart.abortCause`**

```
#Create a logger. Use the path of the chart so each chart will use separate loggers
logger = system.util.getLogger(chart.chartPath + " Logger")

#Invoke the logger. Use chart.abortCause to report the issue
logger.error("Chart Aborted. Reason: %s" % (chart.abortCause))
```

On  
Redundan  
t Failover

This will run once if the chart is activated due to a redundancy failover. Has two special arguments:

- **activeSteps** - A reference to the steps in the chart that are about to become active
- **restartAction** - A dictionary containing settings that allow the chart to be cancelled, restarted from the beginning, or set to a specified step when this script fires. You cannot specify a parallel block as a GOTO step Examples:
  - restartAction.cancel=True
  - restartAction.goto=S2

Related Topics ...

- [SFC Elements](#)

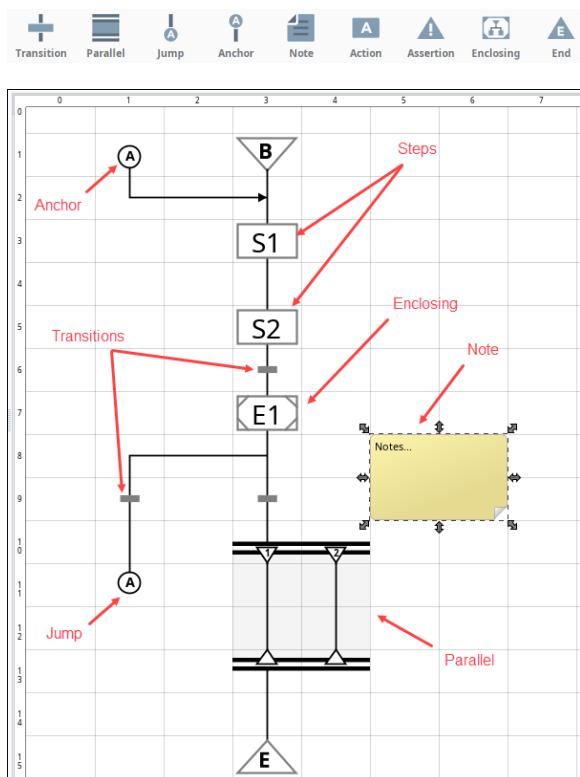
# SFC Elements

SFC Elements are the driving force of a chart. Each element has a purpose or dedicated functionality, and can be combined with other elements to perform complex tasks.. In this section you will see the basic elements that make up every chart. For more information about putting them together, see [SFCs in Action](#).

The chart has some configuration that can determine how and when the chart is started up, as well as opportunities to respond to chart lifecycle events with scripting, such as onStart, onStop, onCancel, and onAbort, see [Chart Lifecycle](#) for details.

## Chart Elements

There are many elements available for charts, similar to Alarm Pipeline Blocks or other Ignition Components. These elements can be combined in various ways to create a flow chart with logic.



## On this page ...

- Chart Elements
- Begin and End Steps
  - Begin Step
  - End Step
- Action Step
- Action Options
  - On Start
  - On Stop
  - Timer
  - Error Handler
- Assertion Step
- Transition
- Parallel Element
- Jump and Anchor
- Enclosing Step
  - Parameter Passing
- Links
- Notes



## Chart Elements

[Watch the Video](#)

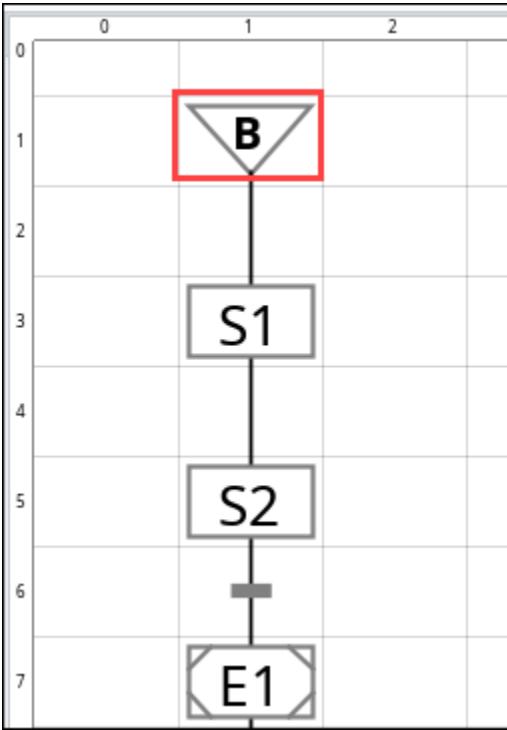
## Begin and End Steps

The Begin step is where each chart starts. The End step finishes the logic flow.

### Begin Step

The **Begin Step** is where all charts start, and cannot be removed, cut, or copied. The begin step is where you can define initial values for your chart's scope. These initial values are also hints as to what parameters your chart expects. If the chart receives any of these parameters as

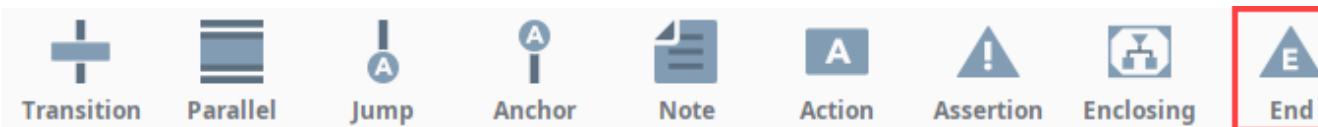
starting parameters, the initial values are ignored.



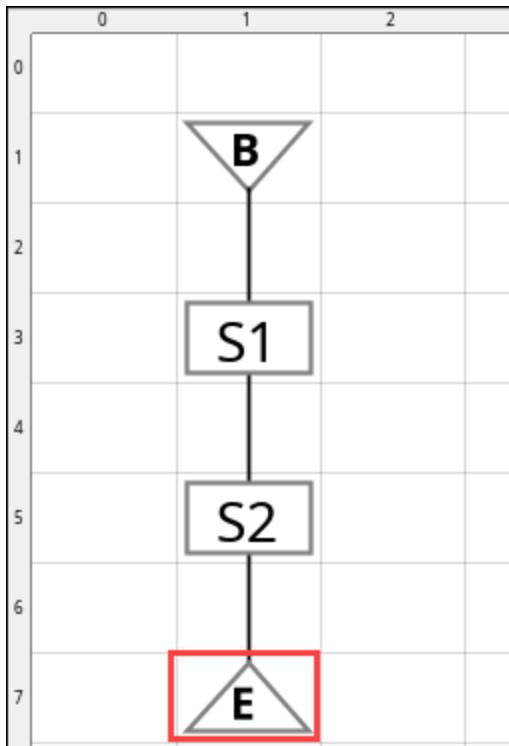
One of the chart parameters defined on the Begin step can be marked as the **Key Param**. This means that this parameter is used as an identifier for the chart. For example, suppose your chart defined the automation process for a car through an assembly line. For example, you can define the car's VIN as the key param, which means that instances of this chart are identified by the VIN they were started with.

## End Step

The **End Step** of a chart has no configuration. This is used to mark the termination of the chart. When a chart reaches this step, it stops executing.



There can be many end steps in a chart, although only one is ever reached for a given chart instance. End steps are not allowed inside parallel sections.

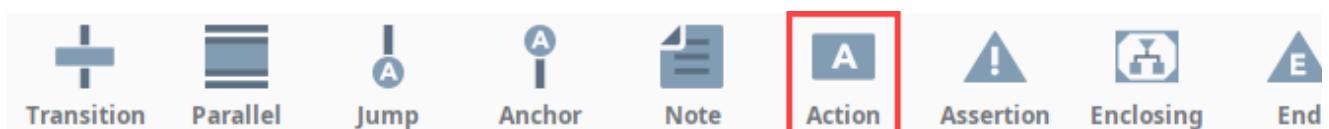


## Action Step

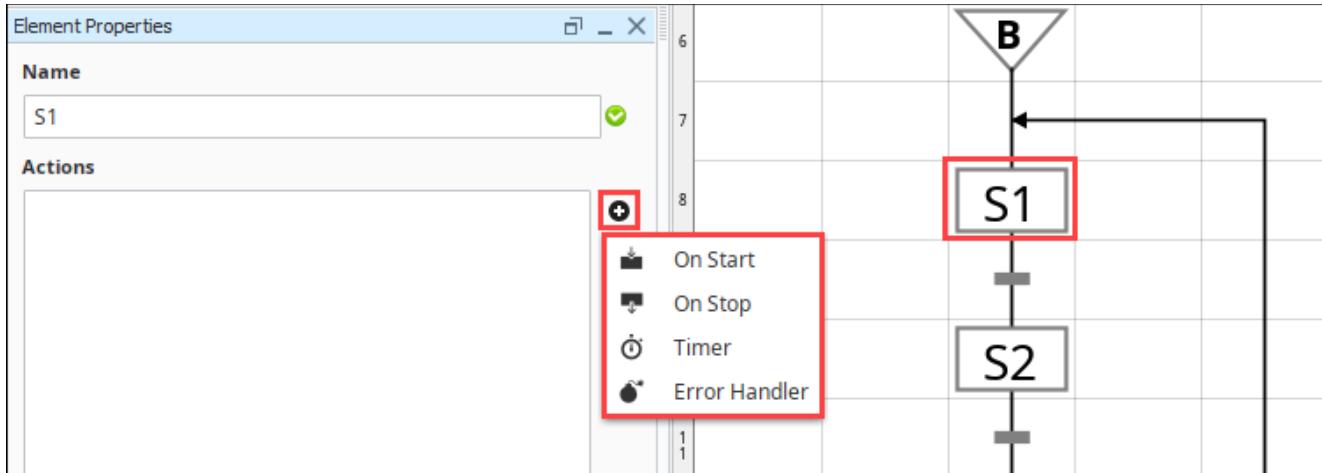
Action steps do the bulk of the work in an SFC.

The action step can have any number of scripts associated with it. Each of these scripts is called an action. There are various kinds of actions. The different kinds of actions execute at different times in the step's lifecycle. During the lifecycle of the step, many actions can run, but only one action is ever allowed to run at a time.

The scripts configured in the action step have access to the chart's scope, as well as a special scope that is private to the step. This scope, called "step scope" is initialized when the step starts and destroyed when the step stops, but retained while the step is running. This is a good place for timer actions to store intermediate results.



## Action Options



## On Start

This action runs when the step is started. These actions always run to completion before flow can move beyond the step, and before any other scripts on the action step will run. This action will always run at least once.

## On Stop

When flow is ready to move beyond the step, it is told to stop. The step will then wait for any currently executing action, for example, **On Start** or **Timer** actions, to finish. Then it will execute its **On Stop** action, if configured. Only after these actions complete will the chart be allowed to move on. This action will always run at least once.

## Timer

Timer actions run every so often while the action step is running. The timer actions only start running after the **On Start** action finishes (if there is one). In addition to the timer action's script, it must have a rate, specified in milliseconds. This is the amount of time to wait between running the timer action's script. The clock starts after the **On Start** action finishes.

It is important to realize that, unlike **On Start** and **On Stop** scripts, a timer action can not run at all for an action step. If the step is ready to stop before the timer is ready, it will never run.

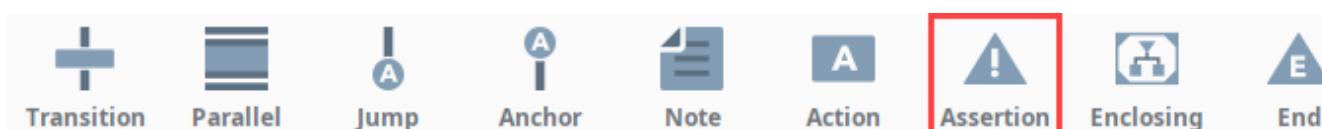
## Error Handler

This action will run only if any of the other actions throw an unexpected error. This provides a chance for chart designers to do their own error handling, and gracefully recover from an error. If this script throws an error, the chart will abort, see [Chart Concepts](#) for more information.

## Assertion Step

Check some conditions before moving on.

The Assertion Step makes one or more conditional assertions and will abort the chart or set a flag based on the result. Each assertion looks at a chart parameter and checks its value. If the value meets the condition, then the assertion passes, and the chart moves on.



Multiple assertions can be added to each Assertion Step, with each requiring a parameter name, an operator, and a value.

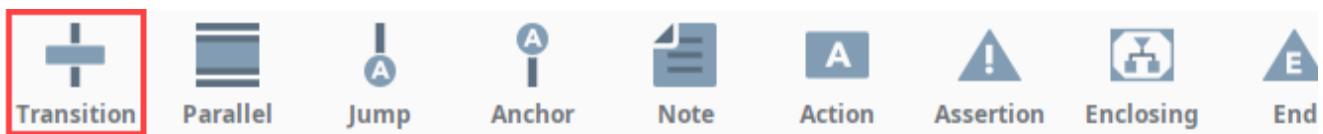
Element Properties

Name	S2	<input checked="" type="checkbox"/>
Assertions		
Parameter	Operator	Value
new_param	=	5
<input type="button" value="+"/> <input type="button" value="edit"/> <input type="button" value="delete"/>		
Upon failure:		
<input checked="" type="radio"/> Abort <input type="radio"/> Set Flag: <input type="text"/>		

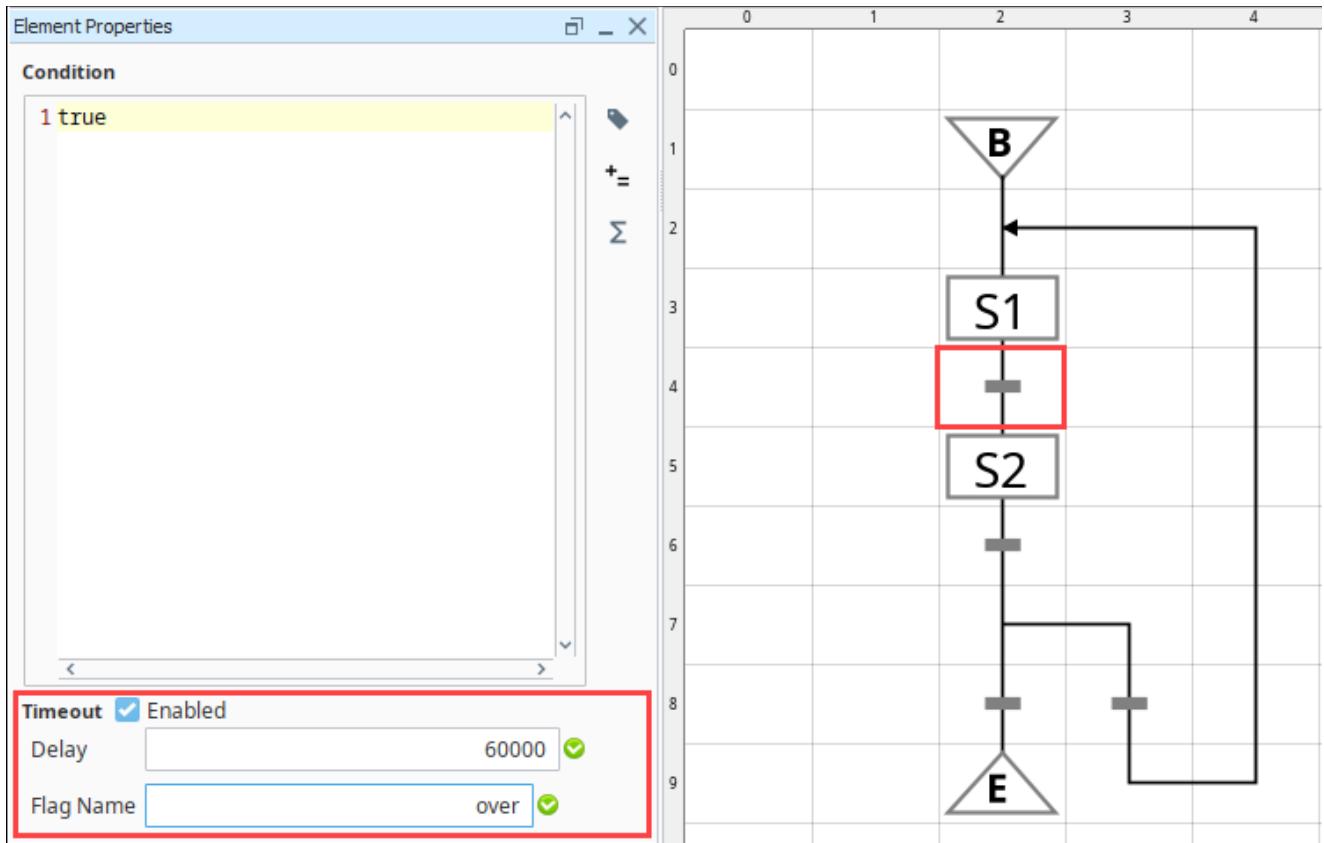
## Transition

Transition elements control the flow of the chart.

A transition serves to either block or allow flow, depending on its value. All transitions have a value: true or false, which is determined by an [expression](#). Transitions occupy a one-cell region of the chart, and are represented by a short horizontal bar in the middle of the cell. Read more about how transitions control chart flow in the [Chart Flow and Rules](#) section.



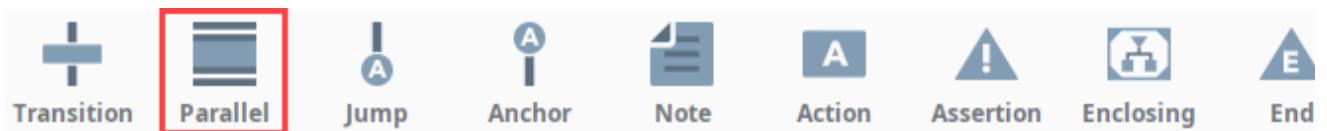
In addition to their expression, a transition can also specify a timeout. If enabled, the transition will set a flag after a certain amount of time has passed. This flag is a boolean variable set in chart scope, and can be used to make the expression or another expression close.



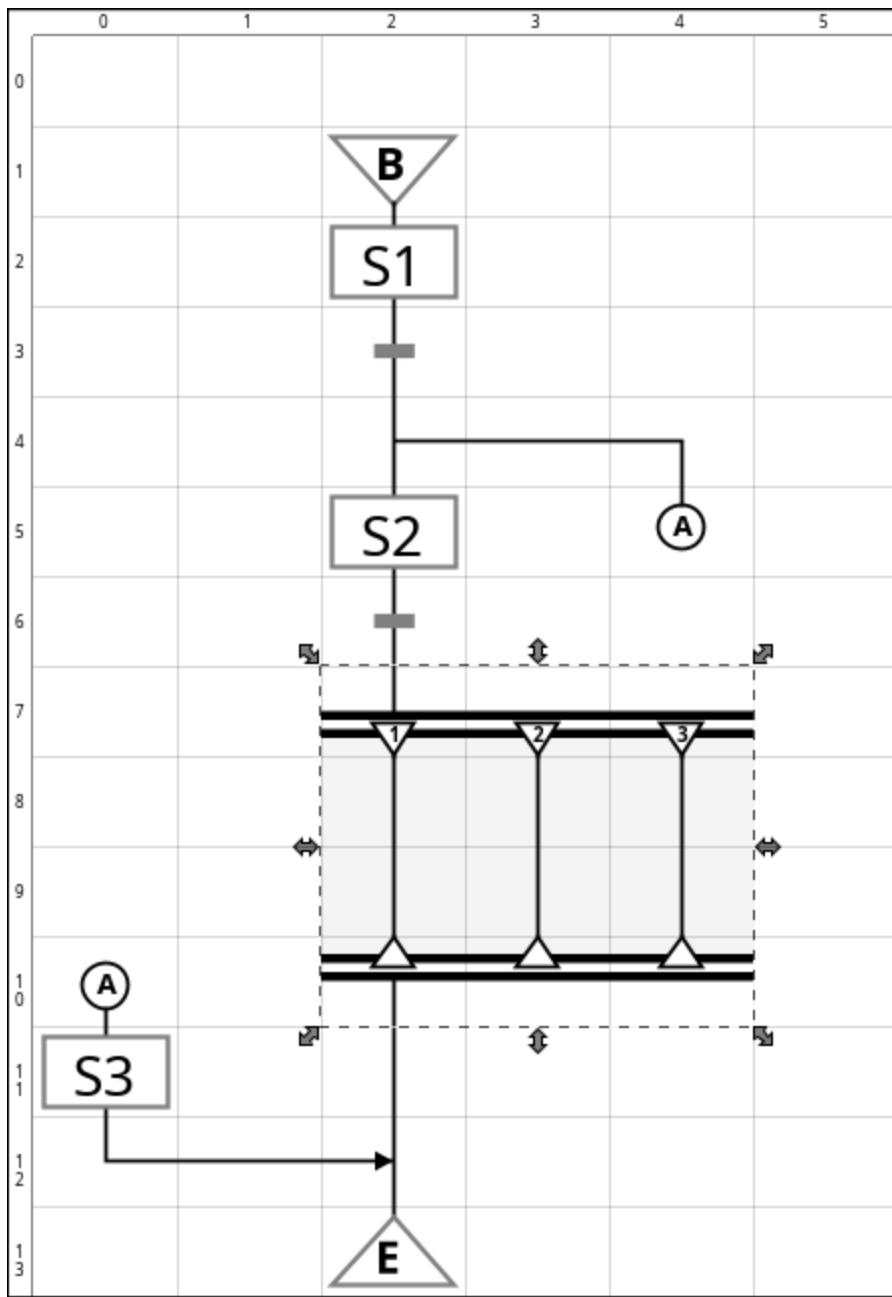
## Parallel Element

A Parallel element contains other elements and executes the logic in parallel. This element is ideal in cases where multiple actions need to execute simultaneously, and you want the chart to pause until all of those actions have completed.

A parallel section is a rectangular section of the chart that can contain other chart elements inside it. The top and bottom of the parallel section is demarcated by two thick, parallel lines. Parallel sections allow for concurrent execution of multiple steps.



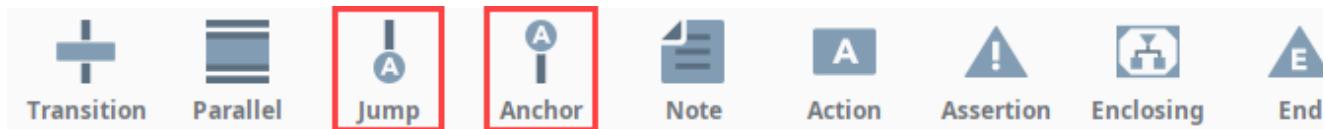
The top lines are called the "parallel branch" and the bottom are the "parallel sync". These sections are used to execute multiple branches of the chart at the same time.

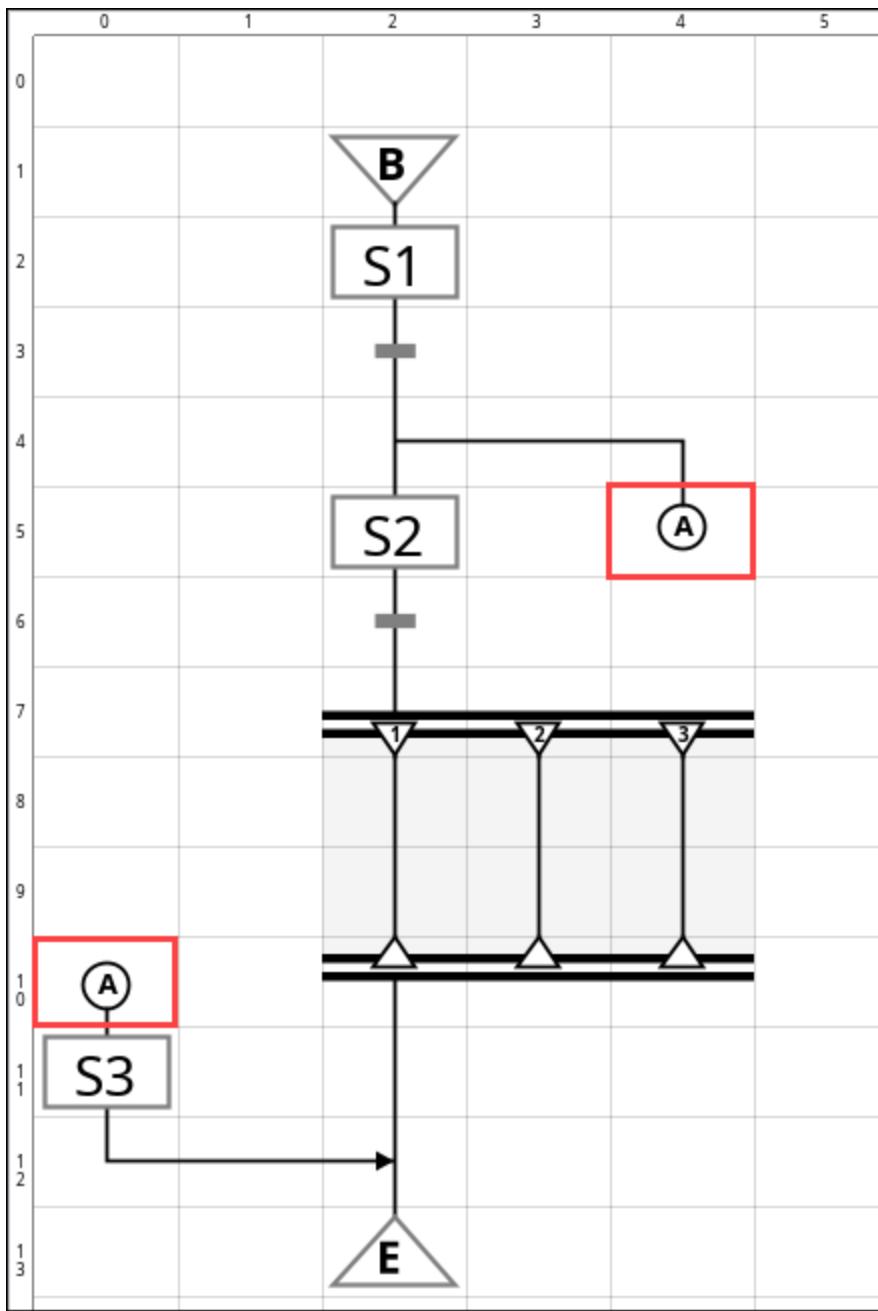


## Jump and Anchor

A Jump element moves the logic of a chart from the jump to a matching anchor element.

A jump is an element that moves the flow to its matching anchor. This is a convenience for when a link would be unsightly or impossible due to crossing other links. Each jump and anchor element is identified by a single character; jumps identified by **X** will jump to the anchor also identified by **X**. There can be many jumps on a chart that all jump to the same anchor.

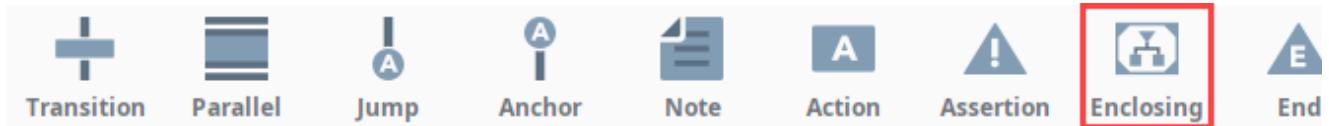




## Enclosing Step

Run another chart inside this one, allowing complex tasks to be spread across several different charts.

The **Enclosing Step** references another SFC defined on the same Gateway. This is an important tool for SFC design, because it lets the chart designer create reusable blocks of logic encapsulated into charts, which can make chart design more modular.



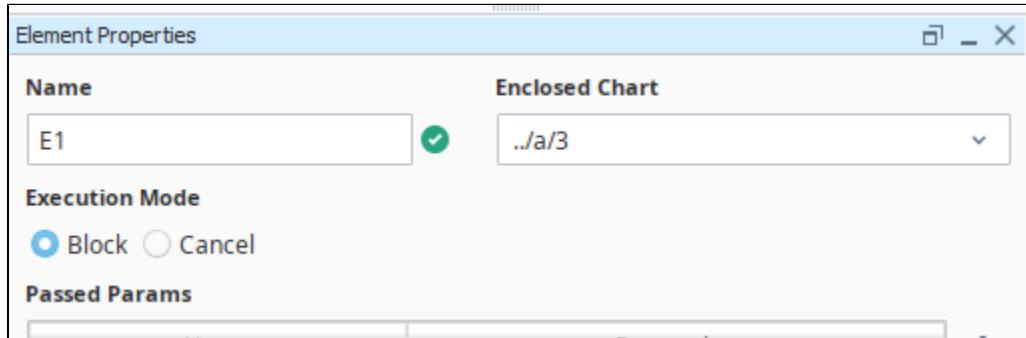
When talking about enclosing steps, the chart that the enclosing step references is called its **enclosed chart**, or **subchart**. The chart that the enclosing step is in is called the **parent chart**.

This feature is new in Ignition version **8.1.2**  
[Click here](#) to check out the other new features

As of release 8.1.2 you can include a relative path in the Enclosed Chart field.

```
# A '.' is used to reference a hierarchy object in the same folder  
./myChart  
  
# '...' is used to reference the parent folder of the current object  
../myChart
```

In addition, the Enclosed Chart dropdown will now automatically use relative path notation.



When flow reaches an enclosing step, it starts its enclosed chart. Using the enclosing step's Execution Mode property, the step can be configured to work in one of two very different ways:

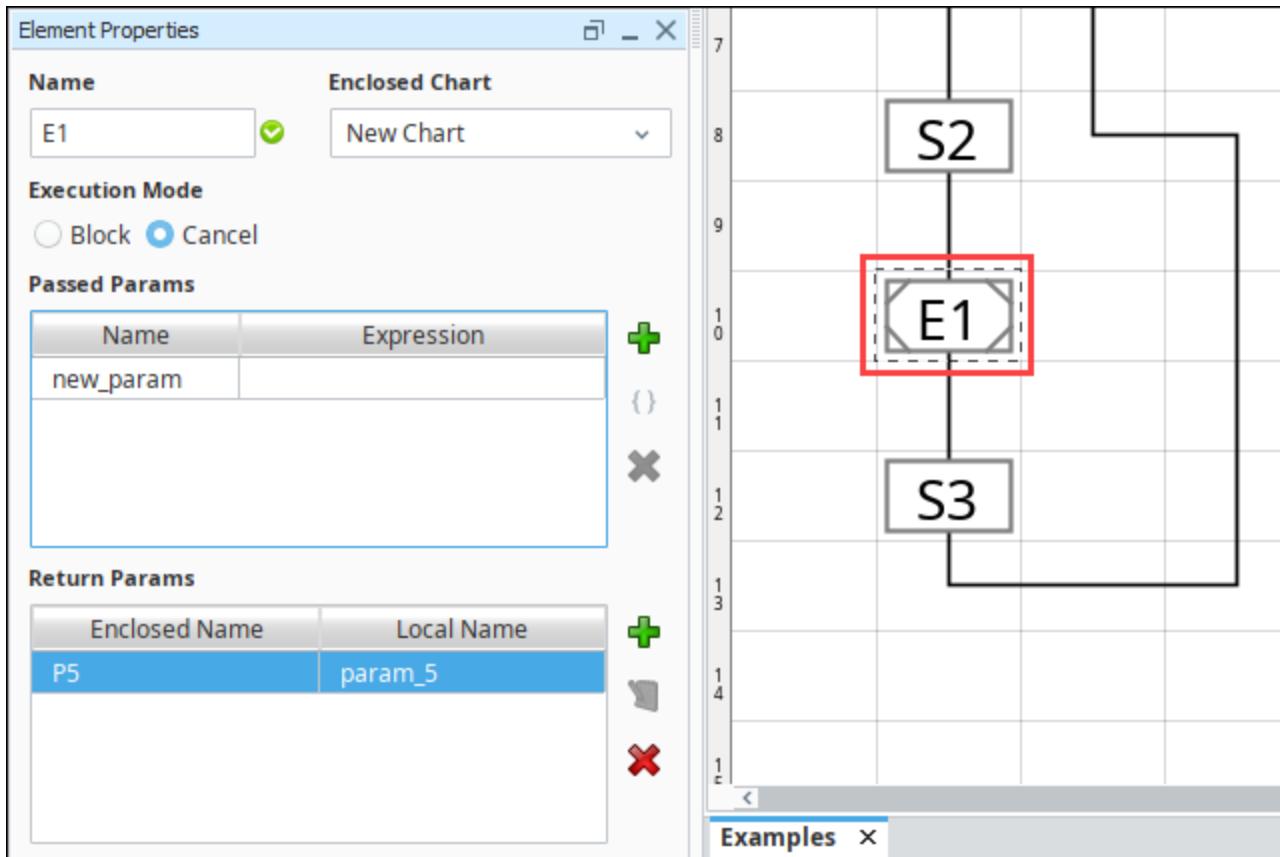
- **Execution Mode = Block**  
Let the enclosed chart run to completion. This means that the enclosed chart should have an **End Step** in it, and that flow will not be able to move beyond the enclosing step until the enclosed chart stops by reaching its end step.
- **Execution Mode = Cancel**  
Cancel the subchart when the enclosing step is ready to stop. This means that the subchart is canceled when flow is ready to move beyond the enclosing step. Any running steps in the enclosed chart are told to stop, and flow ceases in the enclosed chart.

## Parameter Passing

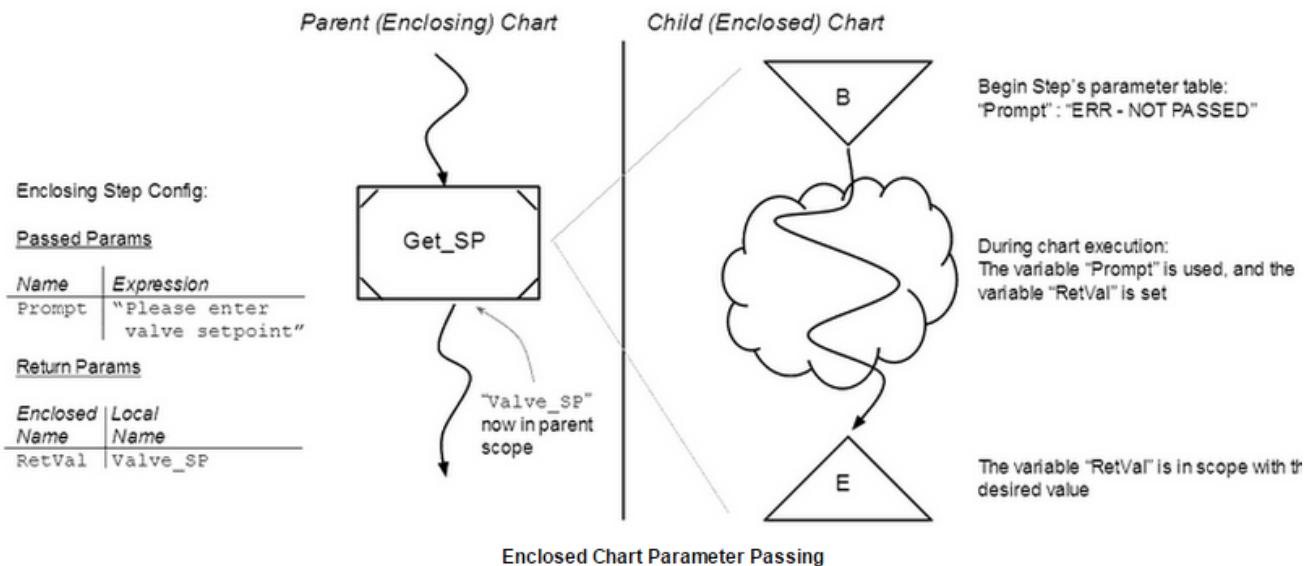
When invoking a subchart via an enclosing step, you have the opportunity to define how variables are passed and returned between the parent and child chart's scopes.

The enclosing step can define a list of parameters to be passed into the enclosed chart's scope. The values for the parameters will be expressions, thus they can be literal values or they can be references to variables in the enclosing chart's scope.

The enclosing step can also define a list of **return values** to receive from the enclosed chart. This is a mapping of variable names from the enclosed chart's scope to variable names in the parent chart's scope.

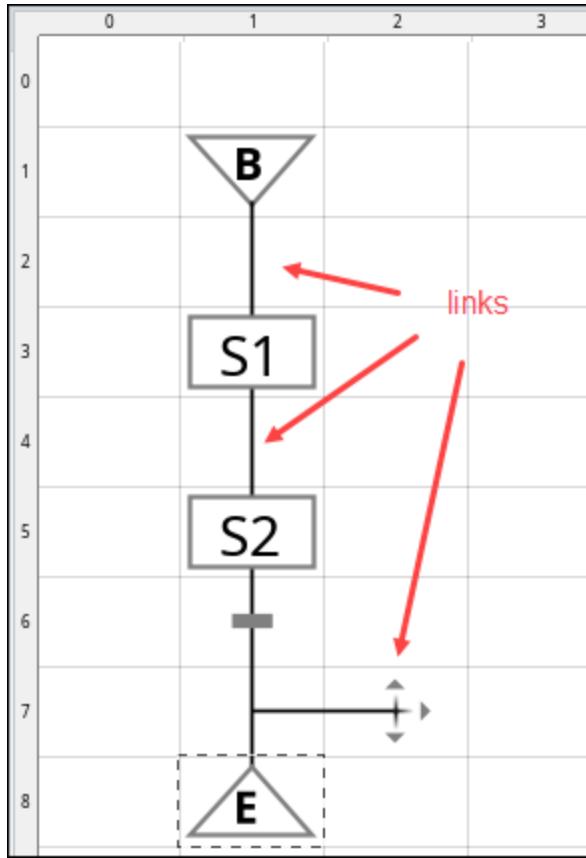


Return values can now be mapped to Chart Scoped Variables by using the same syntax that they would in the passed parameters. See [Chart Scope and Variables](#).



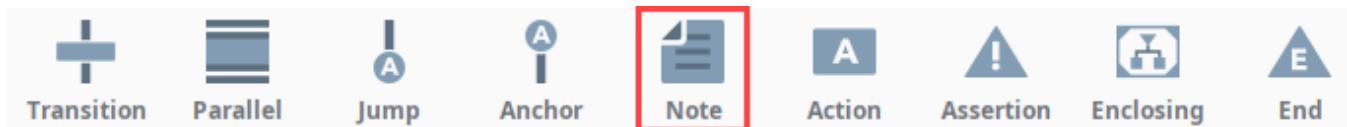
## Links

A link is simply a line that connects other elements. Links are created in the Designer by dragging the arrows that appear next to unconnected elements. Links cannot cross above or below other elements or links. Links only travel in a single direction. This direction is determined by what the link is connecting to. Most elements such as steps and transitions only accept incoming links from above and outgoing links from below.

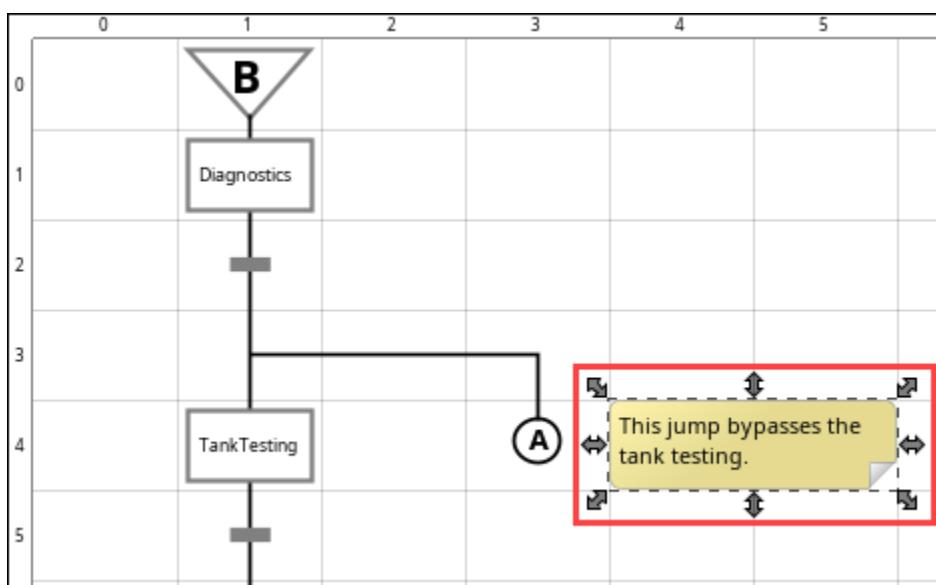


## Notes

Notes are elements which have no import or function, but serve as documentation.



Note elements can be placed anywhere except that they can not overlap other elements. Notes are used to annotate chart logic but have no effect on the chart itself.





# SFCs in Action

## Chart Flow

All charts have the same basic flow to them. Some have loops, jumps, or enclosing steps that include whole other charts, but the flow is always the same:

- All charts start at their begin step. The begin step can define initial values for variables in the chart's scope. These initial values are defined as expressions.
- Flow always moves downward out of chart elements, except for links, which can move flow in any direction. When a transition splits into two or more, they are evaluated left-to-right.
- When flow hits a step, that step is started. The step continues to execute until the transition beneath it becomes true. If there is no transition beneath a step, the step starts and is told to stop as soon as possible. In practice, this means that an action step's `onStart` and `onStop` scripts will be run, but no timer scripts.
- When any End step is activated, the chart stops.

## On this page ...

- [Chart Flow](#)
- [Starting a Chart](#)
- [Interaction and Monitoring](#)
- [Examples](#)
  - [Basic Transition](#)
  - [Branching Transition](#)
  - [Loop](#)
  - [Parallel Execution](#)
- [Interacting with a Client](#)

## Starting a Chart

A chart can be started in one of four ways:

### 1. From Scripting

Using the `system.sfc.startChart` method of the scripting API, a chart can be started from anywhere. The chart must be in **Callable** execution mode.

### 2. From an Enclosing Step

A chart can spawn an instance of another chart using an [Enclosing Step](#).

### 3. Automatically

A chart whose execution mode is **RunAlways** is automatically started when the Gateway starts up. If the chart stops, the Gateway does not re-execute it. If you want a chart that runs all the time, it should be designed to never stop, for example, by looping back upon itself continuously.

### 4. From the Designer

While designing a chart, you can start instances of it from the **Chart Control** panel in the Designer using the **Start** link.

## Interaction and Monitoring

While SFCs are run in the Gateway, Ignition has tools to help you interact with and monitor charts in the client. There is a [chart monitor](#) component that you can use to see the status of your SFCs in the client, there are scripting tools to [start, stop, pause, and resume charts](#) from the client, and you can send operator input to a chart with scripting functions.



## Starting a Chart

[Watch the Video](#)

**Start the Chart**

```

graph TD
    Start((B)) --> BE1[Boundary Event]
    BE1 --> Error[Error E]
    Error --> Prompt[Prompt]
    Prompt --> Parallel1[Parallel Region]
    Parallel1 --> A[A]
    Parallel1 --> B[B]
    A --> AE1[Boundary Event]
    B --> BE2[Boundary Event]
    AE1 --> ErrorAE1[Error E]
    BE2 --> ErrorBE2[Error E]
  
```

**Chart Feedback**

Choose wisely

A

B

Name	Value
activeSteps	{"970968ad-78f2-478c-877e-f4cc240e5498":{"name": "..."}}
chartPath	User Choice
instanceId	9e764807-134c-4b30-84a4-6b4b2fac6e30

## Examples

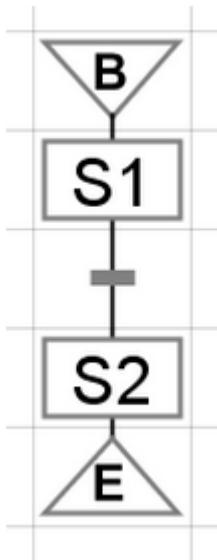
Here are some examples of common paths or loops to get you started thinking about your process. You can combine these steps in any way, and create charts large or small.

### Basic Transition

In this example, step S1 executes as soon as the chart starts, and continues executing until the transition beneath it becomes true. Once that transition becomes true, Step S1 is told to stop, which means it finishes executing any scripts that are currently running, and then it executes its onStop action (if any).

After S1 has stopped, step S2 starts. It is immediately told to stop, which means that if it has any timer actions, they will not run, but the start and stop actions will run.

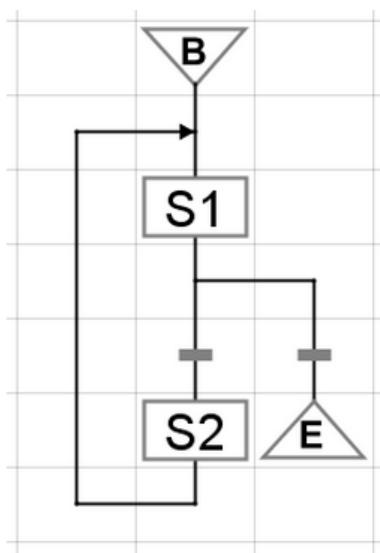
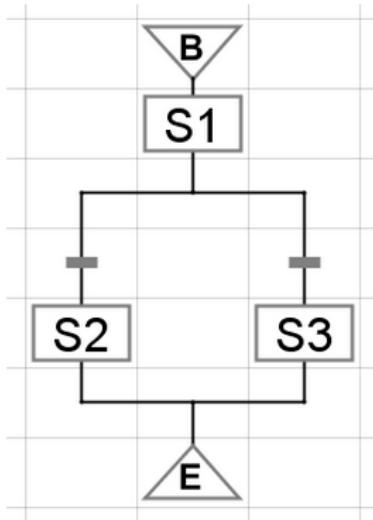
After S2 is finished, the chart stops.



### Branching Transition

In this example, step S1 executes as above, except that it has two transitions beneath it. This is how you do conditional logic in a chart. S1 runs until either of these transitions becomes true. When one transition becomes true, flow will follow that branch of the chart. If both transitions are true, the transition on the left is chosen. Position is meaningful for charts - transition precedence goes from left to right.

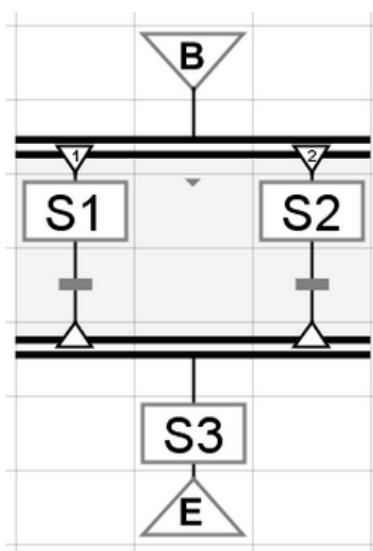
Only one of S2 or S3 will run, but never both.



### Loop

In this example, S1 executes as above, looping until one of the transitions becomes true. If the branch to S2 becomes active, S2 runs once and then S1 starts looping again immediately. This way the chart can execute multiple times.

This is how you configure repeating logic in a chart. The two transitions determine whether this chart continues running (possibly indefinitely) or stops.



### Parallel Execution

In this example, steps S1 and S2 execute simultaneously. They both continue to run until the transitions beneath them become true.

Flow only moves past the parallel sync (the bottom of the parallel section) once both transitions become true. Step S3 then runs, and then the chart stops.

Interacting with a Client

Chart instances are executed in the Gateway scope, which means they can't interact with a client in the typical way. Instead, they need to use message handlers to send information to the client. From a chart, we can use `system.util.sendMessage` to call a client message handler, which can then interact with the client in some way. This may range from altering something on the window to requesting user input.

The client can then call `system.sfc.setVariable` to write back to the chart if necessary, allowing the chart to continue if it was waiting for the input.



## Interacting with a Client

[Watch the Video](#)

[In This Section ...](#)

# Monitoring and Debugging Charts

While a chart is running, it can be monitored visually in the Designer or via a Vision Client.

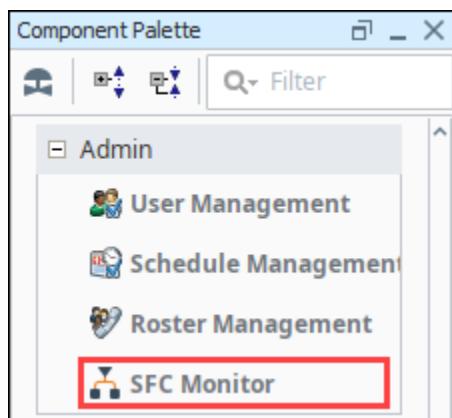
## In the Designer

Open the chart you wish to monitor, and any running instances of that chart will appear in the list to the right of the design space with the heading **Chart Control**.

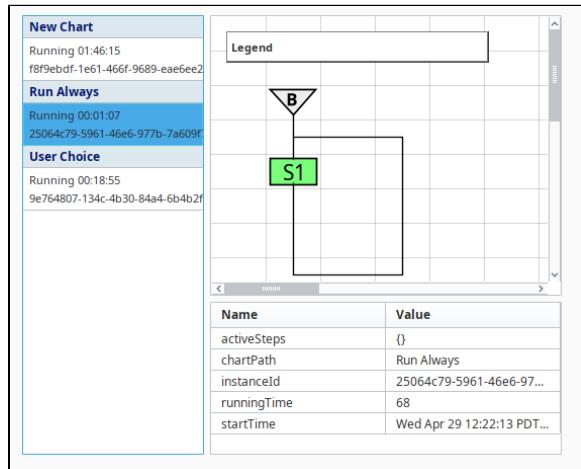
Double-click on an instance to enter monitoring mode. While in monitoring mode, you'll view the current state of the chart elements. There is a banner at the top of the Designer which will bring you back to design mode.

## In a Vision Client

The SFC module adds a component to the Vision module under the **Admin** category called the **SFC Monitor**. Add this component to a window to be able to monitor SFC instances from your project.



This component can either display a pick-list on its left side to pick which instance to monitor, or you can give it the ID of a specific chart to monitor and hide the pick list.



## Element Legend

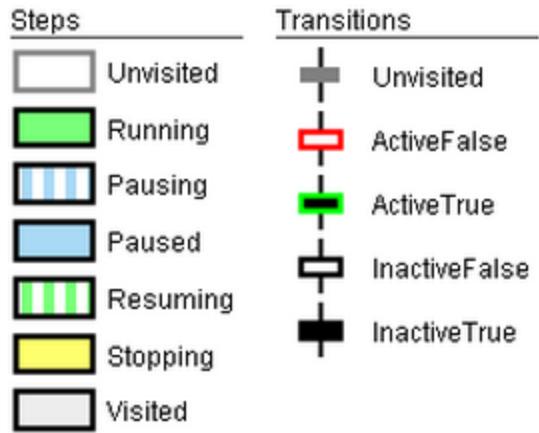
## On this page ...

- [In the Designer](#)
- [In a Vision Client](#)
- [Element Legend](#)



## Monitoring Charts

[Watch the Video](#)



Related Topics ...

- [Pause, Resume, and Cancel](#)

# Pause, Resume, and Cancel

This page details manual state changes that can be enacted on a chart after it has started. These state changes can be triggered via scripting (using some of the [system.sfc](#) functions listed on this page), or via the [SFC Monitor](#) component.

## Security Considerations

Charts can run silently on the Gateway, but being able to interact with the chart from a Client (i.e., pausing a chart) can be useful. Since a chart can be executing some critical process, we highly recommend utilizing [security settings](#) to restrict access to components that are able to modify the state of a chart.

## State Changes - Scripting

### Pausing and Resuming

Any running chart can be paused by using the [system.sfc.pauseChart](#) function. When pausing a chart, any currently executing [action steps](#) must finish before the chart will transition to a paused state. As a result, it may take some time before the chart fully transitions into the Paused state.

Once the chart is paused, it can then later be resumed. This can be done using the **Resume** button in the chart control when testing the SFC Monitor Component, or using the [system.sfc.resumeChart](#) function.

### Cancelling

Canceling a chart works similarly to pausing a chart in that it must first wait for any currently running [action steps](#) to finish execution before the chart will cancel. A chart can be canceled from a script by using [system.sfc.cancelChart](#). Normal [rules for canceling](#) apply, thus the chart's **On Cancel** event will trigger, but not the **On Stop** event.

## State Changes - SFC Monitor Component

Changing the state of a chart can easily be accomplished without scripting from the [SFC Monitor](#) component. From the Client you can right-click on a running chart, and click the state you wish the chart to transition to.

**Note:** The [Chart Lifecycle](#) is still in effect, so only charts in a Paused state may be resumed.

## On this page ...

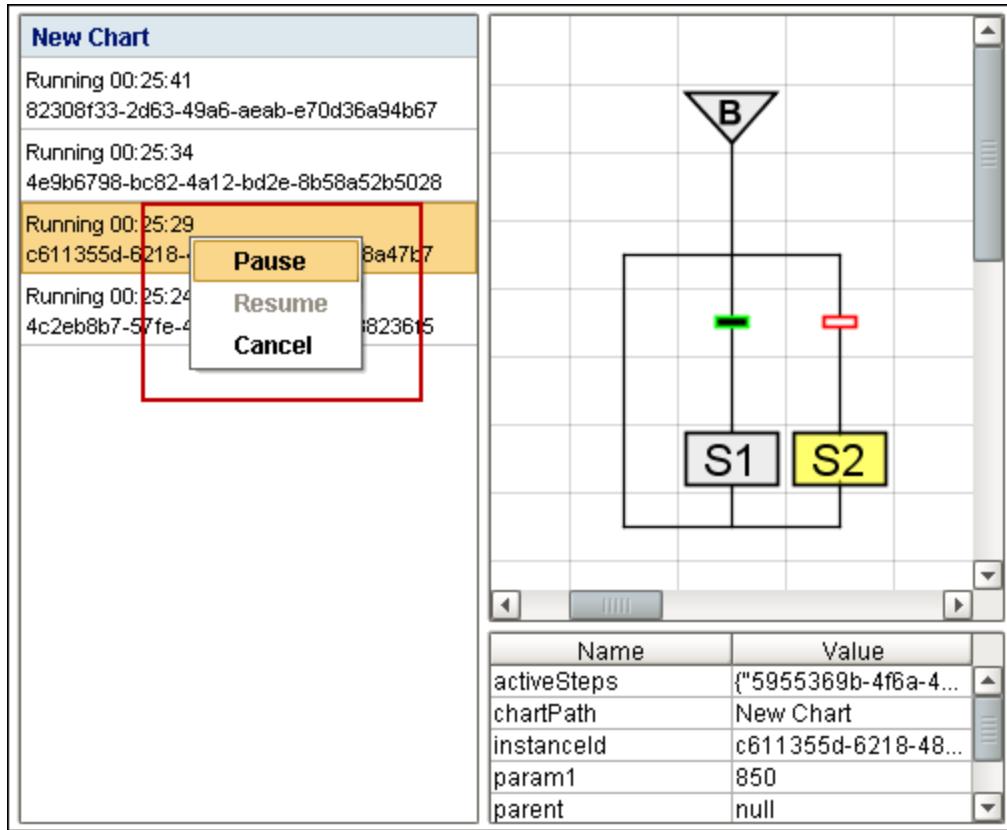
- Security Considerations
- State Changes - Scripting
- State Changes - SFC Monitor Component



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### Pause, Resume, and Cancel

[Watch the Video](#)



Related Topics ...

- Action Step Best Practices
- SFC Monitor Component

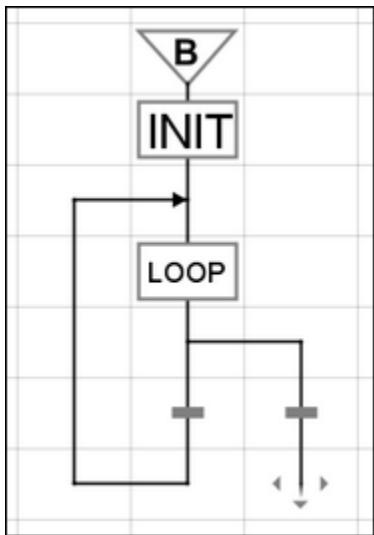
# Action Step Best Practices

When designing SFCs, the Action step will be the primary workhorse of your charts. There are a few best practices to keep in mind while writing your scripts for the action step.

## Use Transactions for Pausing or Waiting

This is the primary rule for SFCs. You want your scripts to run as quickly as possible, so don't Block/Pause /Wait/Sleep. This means that you don't want to use any sort of sleep() or wait() call. Pausing or waiting is the job of transactions in an SFC.

Some sorts of blocking is, of course, unavoidable. For example, running a SQL query that takes some time to execute, or writing to a device over a slow radio connection.



## Action Step Best Practices

[Watch the Video](#)

## Use Refractor Loops

This is really just an extension of the don't block rule. Imagine that you have 100 widgets that need processing. Each widget takes some non-trivial amount of time, let's say, 20 seconds, to process. The most obvious way to handle this would be with an **On Start** script that had a `while` loop from 1 to 100, processing each widget. This script would take about 33 minutes to run.

Instead of processing the 100 items in a `while` loop, you can solve this problem in two different ways with SFCs:

- Timer Action - In this option, you have a single action step, but instead of having your loop from 1 to 100 in a `while` loop, you initialize a counter to 1 in the **On Start** action. Then you write a timer action with a rate of 0ms. The timer action processes one widget, and then increments the counter. You place a transition beneath the step whose expression is: `{counter} >= 100`
- Chart Loop - Similar to option 1, you can design the loop in the chart itself. Have one action step do your initialization work, in our example: `chart.counter = 0`. Have another step do the processing work for one item in its **On Start** script. Use two transitions, the one on the left set to `{counter} < 100` and the one on the right set to `true`. The loop action will run 100 times, and then the flow will continue down the other path.

## Keep Script Duration to a Minimum

By now you should understand that you want to keep your individual script duration to a minimum. You may be wondering why this is so important. After all, in the example above, it still takes 33 minutes to complete the given work after refactoring the loop as shown.

The reason this is important is to support pausing, persistence, and redundancy. Charts can only be paused after any running script finishes. Similarly, a chart's state only gets synchronized with the redundancy system between script executions. If you had a script that took half an hour to run, you couldn't pause that chart until the script ended, and the redundancy system would be very out of date and not able to recover as well if the Gateway went offline.

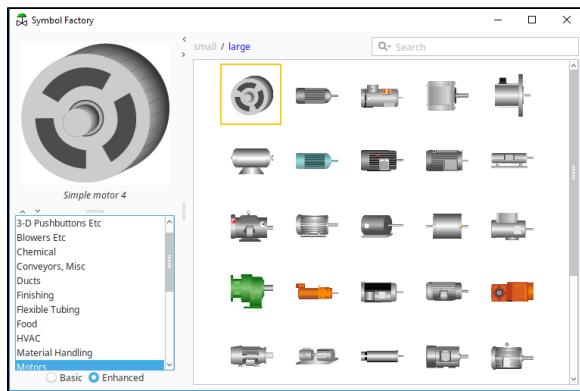
As a bonus, breaking your work up into smaller units helps make the chart easier to debug and more visible for monitoring.

# Symbol Factory

The Symbol Factory module is included with the Vision module or the Perspective module. Symbol Factory provides nearly 4,000 industrial high quality Scalable Vector Graphics (SVG) and symbols for your projects. Vector based graphics can be resized with no pixelation or distortion. You can add these images to your project with a simple drag and drop.

In Vision, the images can also be edited or even [animated](#). In Perspective, if you need animated symbols, try the [Perspective - Symbols Palette](#).

Symbol Factory images are also great for mobile responsive design, or any implementation where users view your HMI and SCADA on screens of various sizes.

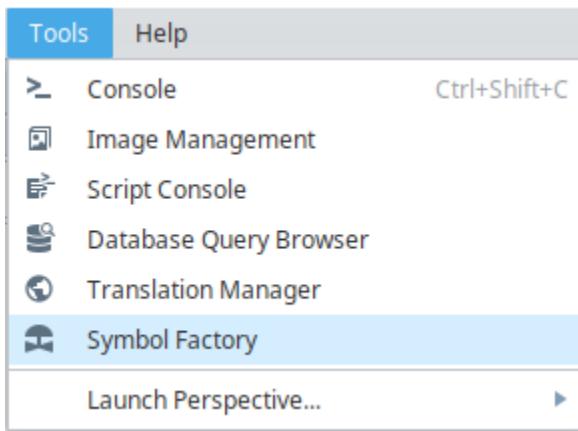


## On this page ...

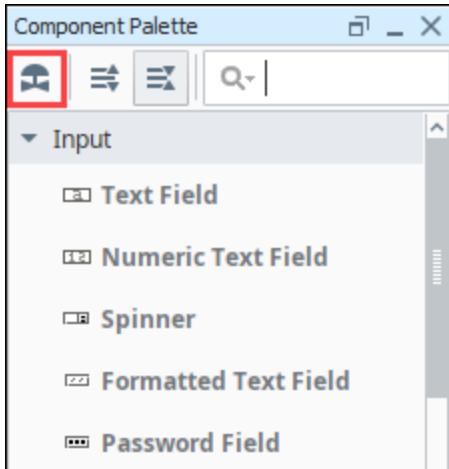
- [Using the Symbol Factory](#)

## Using the Symbol Factory

1. Launch the Designer and open your project.
2. Choose **Symbol Factory** under the **Tools** menu or the project navigation tree. If you can't find these, the Symbol Factory module probably isn't installed. The Symbol Factory browser opens as a pop-up window that stays on top of the Designer.



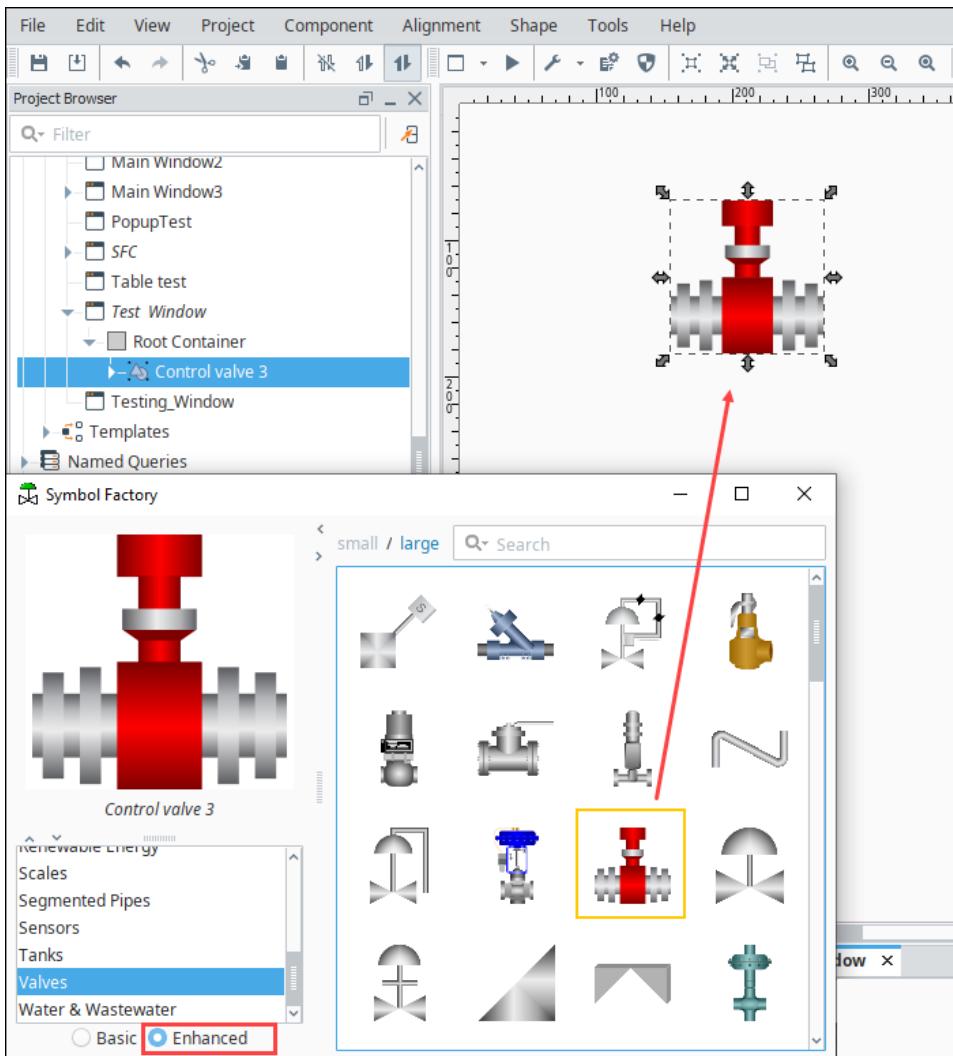
3. In the Vision module, there is also an icon (valve icon in the upper left) for quick access to the Symbol Factory images at the top of the Component Palette.



4. Browse the different categories to explore what symbols are available, or search to find a specific symbol.

**Note:** When searching Symbol Factory, it is recommended to select the Enhanced radio button in the Symbols List. The enhanced symbols are more detailed. They also have groupings that enable you to more easily [animate](#) them when used in Vision.

5. Find a symbol that you'd like to use and drag it onto an open Vision window or Perspective view.



6. In Perspective, you can resize the image and change the style settings. See [Images, SVGs, and Icons in Perspective](#).
7. In Vision, the symbol will become a group of shapes. See [Images and SVGs in Vision](#).

**Related Topics ...**

- [Images, SVGs, and Icons in Perspective.](#)
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- [Perspective - Symbols Palette](#)

# SECS/GEM

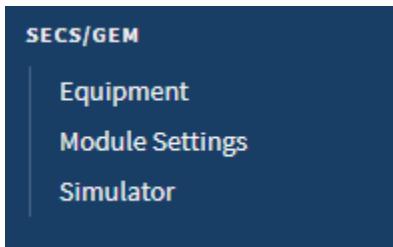
The SECS/GEM (SEMI Equipment Communications Standard/Generic Equipment Model) Module enables Ignition projects and third-party applications to communicate with semiconductor fab equipment. The module is an implementation of the GEM standard (SEMI E30-0307), the SECS-II standard (SEMI E5-0712) and the HSMS standard (SEMI E37-0308).

## SECS/GEM Host

The module is implemented as a host that can talk to one or more tools via equipment connections configured within the Gateway. While it has some built-in simulation functionality to aid with initial setup, the module serves as a host only, and cannot respond as if were equipment.

Communication with equipment is in the form of messages defined by the SECS-II standard and referred to as SECS messages or just messages. By use of a simple definition file, any SECS message (including custom ones) can be supported.

Once the module is installed, a new header is available under the Config section of the Gateway Webpage that allows you to configure connections to the equipment, or setup simulators that are used for testing.



## Equipment Connections

The [equipment connections](#) are what allow Ignition to communicate with the specialized semiconductor fab equipment. Equipment connections are setup within the Configure section of the Gateway Webpage. Connections can be made over Ethernet using TCP/IP (HSMS protocol) or over a direct serial connection (SECS-I protocol) using a RS-232 cable.

**Note:** The direct serial connection requires that the equipment be connected directly to the Ignition Gateway server, and that the Serial Support Gateway Module be installed.

The equipment connections also require the use of a database, which will store sent and received messages for audit purposes, and to hold some configuration data. Each equipment connection connects to one tool and one database and transfers SECS messages between the Gateway to the tool. Any number of equipment connections can be configured in the Gateway as long as your license allows it, and different equipment connections can be configured to use the same database connection or different database connections.

## SECS Definition Language (SDL) File

The [SDL file](#) is where SECS messages are defined. Any SECS message defined in this file can be sent and received. All SECS messages that are sent and received are validated against this file. If a message is not defined or doesn't match a definition then it is not sent, and it is instead inserted into the Errors table as a validation error along with information about why it didn't validate.

Each Equipment Connection has one SDL file and a default SDL file will be used if an alternate is not specified. The SDL file definitions are based on the GEM and SECS standards.

## Simulators

The SECS/GEM Module includes the capability to create and configure [equipment simulators](#). The simulators are not a full implementation of the GEM standard. Equipment Connections can connect to simulators and they can exchange various messages. A range of SECS messages are supported by the simulators. This capability exists for getting started with the SECS/GEM Module and for testing applications.

## SECS/GEM Message Basics

## On this page ...

- [SECS/GEM Host](#)

### Equipment Connections

- [SECS Definition Language \(SDL\) File](#)
- [Simulators](#)

### SECS/GEM Message Basics Definitions

Once a connection has been properly configured to a tool, messages can be sent between Ignition and the equipment. These messages are often complex, which is why SECS messages are often in the form of a JSON string, which can contain any number of lists and name/value pairs. The messages are typically sent and received using specialized scripting functions within Ignition, such as `system.secsgem.sendRequest` and `system.secsgem.getResponse`, that the SECS/GEM module adds.

To send a message, a user calls the `system.secsgem.sendMessage` function in a Python script within an Ignition Gateway or client, and passes the SECS message as **JSON** text to the function. A transaction id is returned, which can then be passed to the `system.secsgem.getResponse` function. This function returns the response from the tool as JSON text. However, some SECS messages can be handled differently, such as those that are sent repeatedly from the equipment like status variables. Those messages can be configured to fire Message Handler scripts in the Gateway or Client when the message is received, which can handle the constant flow of messages in a consistent manner. Alternately, the messages can be configured to create Tags with their values, updating the Tags anytime a new message comes in.

## Definitions

The SECS/GEM Module uses some unique terms that are not used in the rest of Ignition:

Term	Description
SECS /GEM	The SECS/GEM Module is named after two standards the SECS-II standard (SEMI E5-0712) and the GEM standard (SEMI E30-0307). The SECS-II standard defines messages that can be exchanged between a host and an equipment. SECS stands for Semi Equipment Communications Standard. The GEM standard defines ways for equipment to implement functionality using SECS messages. GEM is short for Generic Model for Communications and Control of Manufacturing Equipment.
HSMS Protocol	A TCP/IP based message transfer protocol for sending SECS messages. The SECS/GEM Module uses HSMS or SECS-I for sending messages.
Equipment	A semiconductor device that sends and receives SECS messages. This is also called a tool.
Equipment Connection	An Equipment Connection enables a database interface to an equipment. An Equipment Connection has a connection to an equipment and a connection to a database and transfers SECS messages between them. Ignition projects or third-party applications can insert SECS messages into a database table to send them to an equipment, and query database tables to retrieve SECS messages from an equipment.
Stream	A category of SECS messages.
Function	A specific SECS message in a stream.
Request Message	Also primary message. A SECS message having an odd numbered function that originates a communication and may require a response message.
Response Message	Also reply message. Also secondary message. A SECS message with an even numbered function that is a response to a request message.
SDL File	Also SECS Definition Language file. A file consisting of definitions of SECS messages and definitions of items used in SECS messages. This file is used to validate SECS messages that are sent and received and to add various functionality having to do with them.
SECS-1	A serial-based message transfer protocol used for sending SECS messages. The SECS-I standard is SEMI E4.
SECS Message	Also just message. A communication message in the format specified by the SECS-II standard that is used to communicate with an equipment.
Transaction	A request message and its response message if required.
TransactionID	Also TxID. Every request message has a unique 32-bit integer identifier that identifies the transaction. Every response message has the same TransactionID as the request message it responds to. In the HSMS and SECS-1 protocols, this is called System Bytes.

In This Section ...

# Using the SECS/GEM Module

## Getting Started Tutorial

This tutorial will get you up and running with a demo project that uses the SECS/GEM Module.

## Download and Installing the the Module

Go to the [Downloads page](#) and under the Device Connectivity section, download the SECS/GEM Module. Once the module is downloaded to your computer, install the module. This is done in the normal way that Ignition modules are installed by going to the Gateway Webpage and selecting **Config > System > Modules**. See the [Installing or Upgrading a Module](#) page for more information.

### Naming Conventions

Before getting started, it's a good idea to establish a naming convention when setting up your SECS /GEM Module so you know at a glance what elements are related to each other. This is helpful when you have multiple pieces of equipment, simulators, databases, and equipment connections with keeping these elements organized.

## On this page ...

- [Getting Started Tutorial](#)
- [Download and Installing the the Module](#)
- [Configuring the Database Connection](#)
- [Configuring the Simulator](#)
- [Creating an Equipment Connection](#)
  - [Equipment Connection Status](#)
- [Download and Restore the Demo Project](#)
- [Using the SECS/GEM Demo Project](#)
- [Display Tabs](#)

## Configuring the Database Connection

To setup a database connection in Ignition that you want to use with the SECS/GEM Module, go to the **Config** section on the Gateway Webpage. Scroll down to **Database > Connections**. The Database Connection name that is configured for this example is called **SecsGem**.

The SECS/GEM Module has been tested with MySQL, SQL and Oracle Servers. The SECS/GEM Demo project that you will upload later as part of this tutorial currently only supports MySQL. More information about configuring a database connection can be found in [Connecting to Databases](#).

## Configuring the Simulator

The SECS/GEM Module can directly interact with a piece of equipment, but we can also use the built-in simulator. This tutorial will assume you are using a simulator. To configure a simulator, refer to the example below.

The instructions below will walk you through configuring the simulator. Most of the values can be left as defaults to get you up and running quickly.

1. Go to the Gateway Webpage and select **Config > SECS/GEM > Simulator**.
2. On the Simulator page of the Gateway, click on the [Create new Simulator](#) link.
3. **Simulator Name** - enter the simulator name (i.e., **SimEquip**).
4. **Active Port** - use the default port number of **5000**. The port number needs to be unique if you're using multiple simulators.
5. **Passive Port** - use the default port number of **5000**. The port number needs to be unique if you're using multiple simulators.
6. **Device ID** - use the default ID of **0**. Each piece of equipment must have a unique device ID, and must be an integer.
7. **Connection Mode** - use the default **Passive mode**. The Connection Mode is a property that is configured in both the Simulator and Equipment Connection settings, and cannot be set to the same method. Alternating mode can be used, in which case, it will switch between Active mode and Passive mode until a connection is made.

## Simulator

Main

Simulator Name	SimEquip
Choose a name for this simulator.	
Simulator Description	
Enabled	<input checked="" type="checkbox"/> Disabling a simulator will prevent communication with an Equipment Connection. (default: true)
Active IP Address	localhost
IP Address of Equipment Connection to connect to. Used when simulator is in Active mode. (default: localhost)	
Active Port	5000
Port number of Equipment Connection to connect to. Used when simulator is in Active mode. (default: 5,000)	
Passive IP Address	localhost
IP Address of Ignition that an Equipment Connection will connect to if simulator is in passive mode. (default: localhost)	
Passive Port	5000
Port number that an Equipment Connection will connect to if simulator is in passive mode. (default: 5,000)	
Device ID	0
Unique identifier of equipment. Must be an integer. (default: 0)	
Connection Mode	PASSIVE
Method used to connect. (default: PASSIVE)	

8. Click on the **Create New Simulator** button once you entered all your configuration settings. The window will refresh telling you the simulator was created successfully, and the status will toggle back and forth between "Connecting" and "Not Connected" until an equipment connection is created.

Simulators		
Successfully created new Simulator "SimEquip"		
Simulator Name	Simulator Description	Status
SimEquip		Not Connected
SimFour		Communicating

For more information on configuring a simulator, refer to the [SECS/GEM Simulator](#) page.

### Trial Mode Reset

If you do not have a SECS/GEM Module license installed, the simulators and equipment connections will cause communication to be stopped when the Gateway Trial Mode expires in 2 hours. Reset the trial mode on the Gateway Webpage to resume equipment and simulator communications. You can find more information about Trial Mode on the [About the Trial Period](#) page.

## Creating an Equipment Connection

Once the simulator is configured, (or if there is an actual piece of equipment you wish to connect to), a connection to the Equipment must be made on the **Config > SECS/GEM > Equipment** section of the Gateway Webpage. To configure an equipment connection, refer to the example below.

When creating the equipment connection, most of the settings can be left as the default values for this tutorial. Use the following instructions to configure the equipment connection.

1. On the **Equipment Connections** page, click on **Create new Equipment Connection...**
2. On the **Add Equipment Connection Step 1: Choose Type** page, select **Ethernet/HSMS Connection**, and click **Next**.
3. On the Equipment Connection page:
  - a. **Equipment Name** - enter the equipment name (i.e., **Equip\_MySim**).
  - b. **Enabled** - default set to '**true**'. Enables communication to the target equipment.
  - c. **Active IP Address** - use the default of **localhost**.
  - d. **Active Port** - use the default port number of **5000**. The Active Port number must match the port number used in the simulator configuration setup (i.e., 5000).
  - e. **Passive IP Address** - use the default of **localhost**.
  - f. **Passive Port** - use the default port number of **5000**. The Passive Port number must match the port number used in the simulator configuration setup (i.e., 5000).
  - g. **Connection Mode** - use the default **Active mode**.
  - h. **Device ID** - the default ID is **0**. Each equipment requires a unique identifier, and must be an integer.
  - i. **Database Connection** - enter the database connection name (i.e., **SecsGem**). This is the database name that was configured in [Configuring the Database Connection](#) step.
  - j. **Database Table Prefix** - enter a table prefix (i.e., **Sim\_**). This is the prefix that will be prepended to each of the database table names that are automatically setup when the connection is made. If no prefix is specified, the table will still get created. The advantage of using a prefix is it helps keep database tables organized, and it is used to differentiate one equipment's tables from another equipment's tables. It also allows you to filter a project based on the prefix.
  - k. **SECS Definition Language (SDL) File** - use the default file **messages.sdl**. Validates sent and received messages.

### Equipment Connection

Main	
Equipment Name	<input type="text" value="Equip_MySim"/> Choose a name for equipment connection settings.
Equipment Description	<input type="text"/>
Enabled	<input checked="" type="checkbox"/> Disabling a connection will prevent communication to the target equipment. (default: true)
Active IP Address	<input type="text" value="localhost"/> IP Address of equipment to connect to. Used when SECS/GEM module is in Active mode. (default: localhost)
Active Port	<input type="text" value="5000"/> Port number of equipment to connect to. Used when SECS/GEM module is in Active mode. (default: 5,000)
Passive IP Address	<input type="text" value="localhost"/> IP Address of ignition that an Equipment will connect to if SECS/GEM module is in passive mode. (default: localhost)
Passive Port	<input type="text" value="5000"/> Port number that an Equipment will connect to if SECS/GEM module is in passive mode. (default: 5,000)
Connection Mode	<input type="radio"/> ACTIVE Method used to connect to equipment. (default: ACTIVE)
Device ID	<input type="text" value="0"/> Unique identifier of equipment. Must be an integer. (default: 0)
Database Connection	<input type="text" value="SecsGem"/> This database connection will be used to send and receive data.
Database Table Prefix	<input type="text" value="Sim_"/> SECS/GEM database table names will use the specified prefix for this equipment connection. If no prefix is specified then no prefix will be used. (default: )
SECS Definition Language (SDL) file	<input type="button" value="Choose File"/> No file chosen This file validates SECS messages sent and received. By default messages.sdl is used. (default: messages.sdl)

- I. Once all the configuration settings are entered, click on the **Create new Equipment Connection** button. The Equipment Connection will try to connect to the simulator that you setup in [Configuring the Simulator](#) section. The window will refresh showing a status of "Connecting" until the equipment connection is created.

More information connecting to a tool can be found on the [SECS/GEM Equipment Connections](#) page.

## Equipment Connection Status

The status of the Equipment Connection is shown in the Status column on the Equipment Connections webpage. When the status changes to "Communicating", the Equipment Connection successfully connected to the simulator.

Equipment Connections				
Equipment Name	Equipment Description	SECS Definition Language (SDL) file	Connection Type	Status
Equip_MySim		messages.sdl	Ethernet/HSMS Protocol	Communicating
EquipmentFour		messages.sdl	Ethernet/HSMS Protocol	Communicating

## Download and Restore the Demo Project

At this point, the bare minimum requirements to start utilizing the SECS/GEM module have been met. However, there is a free SECS/GEM Demo Project available from the Ignition Exchange that can be very helpful. This demo project contains resources that allow you to start interacting with the SECS/GEM module.

The demo project can be found here: [SECS/GEM Demo Project](#)

You can learn more about the Ignition Exchange, such as how to import the demo project, on the [Ignition Exchange](#) user manual page.

## Using the SECS/GEM Demo Project

Once you restored the demo project, launch a client from the Gateway Webpage under the **Home** section to begin using the module. For more information, refer to the page on [Launching Clients](#).

When the client is open, there will be three dropdown menus at the top left of the application. From the dropdowns, make the appropriate selections. If you followed the tutorial, the selections are shown below.

- **Datasource:** Select the database connection (i.e., **SecsGem**).
- **TablePrefix:** Select the TablePrefix (i.e., **Sim\_**).
- **Equipment:** Select the name of your Equipment Connection (i.e., **Equip\_MySim**).



You should now be able to view and send SECS messages in the application. You can get started by clicking on the **Establish Comm** menu item

under the Navigation tree, and then by clicking on the **Send S1F13** button. You will see some messages populate the **Search & Display** table.

The screenshot shows the SECS/GEM Demo Project application window. On the left, the **Navigation** tree includes categories like Main Windows, Welcome, Search & Display, Send Message, Communications (with Establish Comm selected), Status Variables, and Request Values. The **Equipment Connection Status** section shows "Communicating". In the center, the **Send SECS Message** tab is active, displaying the message **S1F13, Establish Communication** and its purpose. A red box highlights the **Send S1F13** button. The **Search & Display** tab shows a table of messages:

SF	Direction	ReqRes
S1F14	Sent	Response
S1F13	Received	Request
S1F14	Sent	Response
S1F13	Received	Request
S1F14	Sent	Response
S1F13	Received	Request
S1F14	Sent	Response
S1F13	Received	Request
S1F14	Sent	Response
S1F13	Received	Request
S1F14	Sent	Response

## Display Tabs

The Display Tabs allow you to see the detailed SECS messages associated with each request and response. There are five Display Tabs: Simple, Tree, Table, JSON, and Python. Select any request or response from the Search and Display table and toggle the Display Tabs to view the SECS messages in their respective formats.

The Display Tabs below show the detailed response message (S1F14) returned back from the Establish Comm request (S1F13).

### Simple Tab

Simple Tree Table JSON Python

### S1F14, Establish Communications Request Acknowledge

Accept or deny Establish Communications Request (S1F13).

**Reply expected:** False

**Direction:** Response from Equipment Connection sent to Equipment

#### Body:

Establish Communications

Acknowledge Code

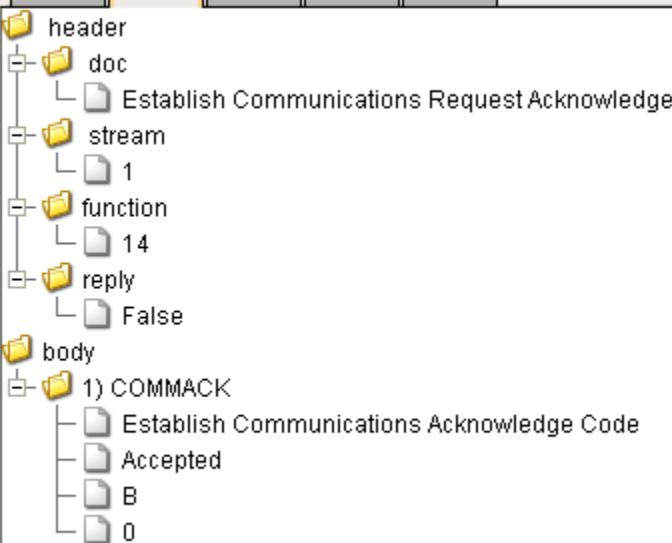
Accepted

Equipment Model Type

Software Revision Code:

#### Tree Tab

Simple Tree Table JSON Python



#### Table Tab

Simple Tree Table JSON Python

path	doc	cod...	format	value
header/doc	Establish Communications Request Acknowl...			
header/stream				1
header/function				14
header reply				False
body/1) COMMACK	Establish Communications Acknowledge Code	Accept...	B	0

#### JSON Tab

Simple Tree Table JSON Python

```
{  
    "body": [  
        {  
            "codeDesc": "Accepted",  
            "doc": "COMMACK, Establish Communications Acknowledge Code",  
            "format": "B",  
            "value": 0  
        },  
        []  
    ],  
    "header": {  
        "doc": "Establish Communications Request Acknowledge",  
        "function": 14,  
        "reply": false,  
        "stream": 1  
    }  
}
```

### Python Tab

Simple Tree Table JSON Python

```
(u'body': [(u'codeDesc': 'Accepted',  
           u'doc': 'COMMACK, Establish Communications Acknowledge Code',  
           u'format': 'B',  
           u'value': 0),  
          []],  
 u'header': {u'doc': 'Establish Communications Request Acknowledge',  
            u'function': 14,  
            u'reply': False,  
            u'stream': 1})}
```

### Related Topics ...

- SECS/GEM Simulator
- SECS/GEM Equipment Connections
- SECS Definition Language (SDL) File

# SECS/GEM Equipment Connections

## Connection Types

Equipment connections can be created using one of two different connection types: Ethernet through a TCP/IP network, or Serial using an RS-232 serial cable. Each uses a different protocol to communicate.

### Ethernet Connections

Ethernet connections use the HSMS protocol for communication. The name of the standard for HSMS is SEMI E37, and are much faster than serial connections. The SECS/GEM module enables ethernet connections automatically and are the preferred method of connection.

### Serial Connections

Serial connections use the SECS-I protocol for communication. The name of the standard for SECS-I is SEMI E4. To use a serial connection, the Serial Support Gateway Module must be installed in addition to the SECS/GEM module. The equipment must also have a direct serial connection to the Ignition Gateway server.

## On this page ...

- Connection Types
  - Ethernet Connections
  - Serial Connections
- Equipment Connection Properties
  - Database Tables
  - SECSGEM\_EquipmentInfo Table
  - Messages Table
  - Errors Table
- Creating an Equipment Connection

## Equipment Connection Properties

When setting up an equipment connection through either ethernet or serial, there are various properties that can be configured.

### Common Properties

Property Name	Description	Default
Equipment Name	The name to give this equipment connection.	
Equipment Description	A description of this equipment connection.	
Enabled	Whether the equipment connection is enabled or disabled. A disabled equipment connection will prevent communication between the Gateway and the equipment.	true
Device ID	A unique identifier of the equipment, which is defined by the equipment. Must be an integer.	0
Database Connection	The Database Connection that will be used to store messages in for audit purposes as well as some configuration data.	
Database Table Prefix	The prefix that will be added to each of the database table names that get automatically setup when the connection is made. Used to help differentiate one equipment's tables from another equipment's tables. If no prefix is specified, then no prefix will be used.	
SECS Definition Language (SDL) File	The file that validates SECS messages sent and received between the Gateway and the equipment. If none is specified, a default messages.sdl file is used. See <a href="#">SECS Definition Language (SDL) File</a> for the default file.	messages.sdl
T3 Reply Timeout	The number of seconds to wait for an expected SECS message reply.	45

**Properties for equipment connections using the Ethernet/HSMS connection type, which connects to equipment using HSMS over TCP.**

Property Name	Description	Default
Active IP Address	IP Address of the equipment to connect to when in Active mode.	localhost
Active Port	The Port number of the equipment to connect to when in Active mode, <a href="#">which must match the port number used to create the Simulator</a> .	5000
Passive IP Address	The IP Address of Ignition that an Equipment will connect to if the SECS/GEM module is in passive mode.	localhost

Passive Port	The Port number that an Equipment will connect to if the SECS/GEM module is in passive mode.	5000
Connection Mode	<p>The Method used to connect to Equipment.</p> <ul style="list-style-type: none"> <li>• ACTIVE - Will attempt to connect to the equipment at the given Active IP Address and Active Port.</li> <li>• PASSIVE - Will listen for a connection from the equipment at the given Passive IP Address and Passive Port.</li> <li>• ALTERNATING - Will switch between Active mode and Passive mode until a connection is made.</li> </ul>	ACTIVE
T5 Connect Separation Timeout	The number of seconds which must elapse between successive attempts to connect to the equipment after disconnection.	10
T6 Control Transaction Timeout	The number of seconds which a control transaction (such as LinkTest or Select) may remain open before it is considered a communications failure.	5
T7 Not Selected Timeout	The number of seconds which a TCP/IP connection can remain in NOT SELECTED state (i.e. no HSMS activity) before it is considered a communications failure. This timeout is only used for Passive Connection Mode.	10
T8 Network Intercharacter Timeout	The maximum number of seconds between successive bytes of a single HSMS message before it is considered a communications failure. This applies to HSMS messages received from the equipment.	5
Keep Alive Timeout	The number of seconds interval for sending LinkTest control messages for testing a connection. Automatically reconnects if the test fails. A value of 0 will disable it.	300

#### Properties for equipment connections using the Serial/SECS-I connection type, which connects to equipment serially using SECS-I.

Property Name	Description	Default
Serial Port Name	The name of the serial port, e.g. "COM1" or "/dev/ttyS0".	COM1
Data Bit Rate	<p>The bit rate of data that is being sent and received. Possible values are:</p> <ul style="list-style-type: none"> <li>• BR_9600</li> <li>• BR_4800</li> <li>• BR_2400</li> <li>• BR_1200</li> <li>• BR_19200</li> <li>• BR_150</li> </ul>	BR_9600
T1 Inter-Character Timeout	The maximum number of seconds allowed for interruptions between characters being sent.	0.5
T2 Protocol Timeout	The maximum number of seconds for a lack of protocol response.	10
T4 Inter-Block Timeout	The maximum number of seconds allowed for interruptions in multi-block messages.	45
Retry Limit	The maximum number of send retries allowed.	3

#### Database Tables

Regardless of the type of equipment connection, database tables are created for each connection based on the prefix specified in the connection if they do not already exist.

**Caution:** No automatic maintenance (such as pruning or partitioning) is performed on these tables. Some of the tables can grow quite large, so it is up to the user to properly manage each set of tables from each equipment connection.

#### SECSGEM\_EquipmentInfo Table

The SECSGEM\_EquipmentInfo table is unique in that only one will get created for all databases that use the same database connection and will not use a prefix in its name. Each row of the SECSGEM\_EquipmentInfo table contains information about a specific Equipment Connection.

SECSGEM_EquipmentInfo		
Column Name	Datatype	Description
Equipment	String	The name of the equipment

Prefix	String	The prefix that the equipment connection uses for its unique tables.
Status	String	The status of the equipment connection.
SDL File	String	The SDL File that was uploaded for this equipment connection. If no file was uploaded, it will use the default messages.sdl.

## Messages Table

The Messages table is where SECS messages are stored after they are sent or received. It will include a prefix in the name if one was specified in the equipment connection. Multiple equipment connections can use the same prefix which will have them write to the same messages table. Because this table records every message between the Gateway and equipment, it can grow quite large.

prefixMessages		
Column Name	Datatype	Description
ID	Auto incrementing PrimaryID, Integer	The ID of the row.
Equipment	String	The name of the equipment.
StreamFunction	String	The Stream and Function such as "S1F1".
Direction	String	Whether the message was received or sent.
RequestResponse	String	Whether the message was a request or a response.
CommonID	String	A special identifier that will link together multiple related messages.
TxID	Integer	The transaction ID of the message.
Reply	Integer	Whether the message expects a reply or not.
Message	String	The JSON string message.
TimeSentReceived	DateTime	A datetime value of when the message was sent or received.

## Errors Table

Any errors that occur are logged to the Errors table. It will include a prefix in the name if one was specified in the equipment connection. Multiple equipment connections can use the same prefix which will have them write to the same errors table.

prefixErrors		
Column Name	Datatype	Description
ID	Auto incrementing PrimaryID, Integer	The ID of the row.
Equipment	String	The name of the equipment.
StreamFunction	String	The Stream and Function such as "S1F1". Only used if the error is related to a SECS Message
ErrorType	String	The type of error that occurred, such as Connection Error, Timeout, or JSON Syntax Error.
Error	String	The error message.
Time	DateTime	The date and time when the error occurred.

## Creating an Equipment Connection

In order to communicate with an equipment or the built-in simulator, an Equipment Connection must be configured in the Gateway. This example walks you through configuring an equipment connection for a piece of equipment.

1. Go to the **Configure** section of the Gateway webpage and select **SECS/GEM > Equipment**.
2. On the **Equipment Connections** page, click on **Create new Equipment Connection...**.
3. On the **Add Equipment Connection Step 1: Choose Type** page, select **Ethernet/HSMS Connection**, and click **Next**.
4. On the Equipment Connection page:
  - a. **Equipment Name** - enter equipment name, (i.e., **EquipOne**).
  - b. **Enabled** - set to '**true**'. Enables communication to the target equipment.
  - c. **Active IP Address** - use the default of **localhost**, or enter the IP address of equipment to connect to when in Active mode.

- d. **Active Port** - set the port number (i.e., **5007**). The Active and Passive port numbers must be unique for each piece of equipment. Note, the Active Port must match the port number used in the equipment or simulator configuration setup.
- e. **Passive IP Address** - use the default of **localhost**, or enter the IP address of the equipment to connect to when in Passive mode.
- f. **Passive Port** - set the port number (i.e., **5007**). The Active and Passive port numbers must be unique for each piece of equipment. Note, the Passive Port must match the port number used in the equipment or simulator configuration setup.
- g. **Connection Mode** - the default is set to **Active**. The Connection Mode is a property that is configured in both the Simulator and Equipment Connection settings, and cannot be set to the same method. Alternating mode can be used, in which case, it will switch between Active and Passive modes until a connection is made.
- h. **Device ID** - enter an equipment ID (i.e.**1**). Each piece of equipment must have a unique ID.
- i. **Database Connection** - enter the database that will be used to send and receive data (i.e, **SecsGem**).
- j. **Database Table Prefix** - enter a prefix to prepend to the database table names. (i.e.,**EquipOne\_**). A prefix will be prepended to each of the database table names that are automatically setup when the connection is made. This is an optional setting, so if no prefix is specified, the table will still get created. The advantage of using a prefix is it helps keep database tables organized, and used to differentiate one equipment's tables from another equipment's tables. It also allows you to filter a project based on the prefix.
- k. **SECS Definition Language (SDL) File** - the default file is **messages.sdl**. Validates sent and received messages.

**Equipment Connection**

Main	
Equipment Name	EquipOne
Choose a name for equipment connection settings.	
Equipment Description	
Enabled	<input checked="" type="checkbox"/> Disabling a connection will prevent communication to the target equipment. (default: true)
Active IP Address	localhost
IP Address of equipment to connect to. Used when SECS/GEM module is in Active mode. (default: localhost)	
Active Port	5007
Port number of equipment to connect to. Used when SECS/GEM module is in Active mode. (default: 5,000)	
Passive IP Address	localhost
IP Address of Ignition that an Equipment will connect to if SECS/GEM module is in passive mode. (default: localhost)	
Passive Port	5007
Port number that an Equipment will connect to if SECS/GEM module is in passive mode. (default: 5,000)	
Connection Mode	ACTIVE
Method used to connect to equipment. (default: ACTIVE)	
Device ID	1
Unique identifier of equipment. Must be an integer. (default: 0)	
Database Connection	SecsGem
This database connection will be used to send and receive data.	
Database Table Prefix	EquipOne_
SECS/GEM database table names will use the specified prefix for this equipment connection. If no prefix is specified then no prefix will be used. (default: )	
SECS Definition Language (SDL) file	<input type="button" value="Choose File"/> No file chosen This file validates SECS messages sent and received. By default messages.sdl is used. (default: messages.sdl)

5. Once all the configuration settings are entered, click on the **Create new Equipment Connection**. The window will refresh showing a status of "Connecting" until the equipment connection is created. When the status changes to "Communicating", the Equipment Connection is successfully created.

**Equipment Connections**

Successfully updated Equipment Connection "EquipOne"				
Equipment Name	Equipment Description	SECS Definition Language (SDL) file	Connection Type	Status
EquipOne	messages.sdl	Ethernet/HSMS Protocol	Communicating	<input type="button" value="More"/> <input type="button" value="edit"/>

Related Topics ...

- [SECS Definition Language \(SDL\) File](#)

# SECS Definition Language (SDL) File

The SECS Definition Language (SDL) file contains definitions that all SECS messages for that equipment connection are validated against. Any messages that fail to validate against the SDL file will be inserted into the Errors table for the equipment connection instead. The SDL file uses JSON syntax to define datatypes, SECS Items, and SECS Messages.

Each equipment connection can accept one SDL file. However, if no file is specified, the default '**messages.sdl**' file will be used. The SECS message definitions in the default SDL file are based on the definitions in the SECS-II standard (SEMI E5-0712) and the GEM standard (SEMI E30-0307).

The SDL files can be edited in the Gateway Webpage using the built in SDL editor, or they can be downloaded from the Equipment Connections page so that they can be edited in a text editor and re-uploaded at a later time.

## On this page ...

- [SDL File Format](#)
- [SECS Datatype Formats](#)
- [SDL Item Definitions](#)
- [SDL Message Definitions](#)
  - [SDL Message Defaults](#)
- [SDL File Editor](#)
  - [Restart the Equipment](#)
  - [Default SDL File](#)

## SDL File Format

The SDL file should be formatted using JSON syntax. It follows a simple structure, which is demonstrated in the example below. There are four main parts to the SDL file:

### doc

The doc comes first and provides any overall documentation for the file. We recommend good documentation so that it is easy to make changes if needed.

### formats

The formats list out all of the datatype formats that the items will use. It does not need to include datatypes that are not used by the items.

### items

The items are used by the messages to relay information to and from the equipment. The items are sorted alphabetically, with each item under its corresponding letter. Each letter can have any number of items under it.

### messages

The messages handle communication with the equipment. Each message is sorted by stream, with each function listed in order under its corresponding stream. There can be multiple streams under messages, and multiple functions under each stream.

#### Example SDL File

```
{  
    "doc": [  
        "The doc for the file."  
    ],  
    "formats": {  
        "A": {  
            "doc": "ASCII"  
        },  
        "I2": {  
            "doc": "Signed Integer Two Bytes"  
        }  
    },  
    "items": {  
        "A": {  
            "ALTX": {  
                "doc": [  
                    "ALTX, Alarm Text"  
                ],  
                "formats": [  
                    "A"  
                ],  
                "max": 120  
            }  
        }  
    }  
}
```

```

        },
        "C": {
            "CCODE": {
                "doc": [
                    "CCODE, Command Code",
                    "Each command code corresponds to a unique process operation the machine is capable of
performing."
                ],
                "formats": [
                    "A",
                    "I2",
                    "I4",
                    "U2",
                    "U4"
                ]
            }
        },
        "messages": {
            "S1": {
                "doc": [
                    "Stream 1 Equipment Status",
                    "This stream provides a means for exchanging information about the status of the",
                    "equipment, including its current mode, depletion of various consumable items, and the
status of transfer operations."
                ],
                "S1F0": {
                    "doc": [
                        "Abort Transaction",
                        "Used in lieu of an expected reply to abort a transaction.",
                        "Function 0 is defined in every stream and has the same meaning in every stream."
                    ],
                    "block": "single",
                    "direction": "h<->e"
                },
                "S1F1": {
                    "doc": [
                        "Are You There Request",
                        "Establishes if the equipment is on-line.",
                        "A function 0 response to this message means the communication is inoperative.",
                        "In the equipment, a function 0 is equivalent to a timeout on the receive timer after
issuing S1,F1 to the host."
                    ],
                    "block": "single",
                    "direction": "h<->e",
                    "reply": true,
                    "autoReply": {
                        "header": {
                            "stream": 1,
                            "function": 2,
                            "reply": false
                        },
                        "body": [
                            ...
                        ]
                    }
                }
            }
        }
    }
}

```

## SECS Datatype Formats

The formats section should list all datatypes that will be used in the items section. The formats section can be as long as it needs to be, and can even consolidate multiple values into a single value for ease of use. Notice in the example below, the different size integer and floats can all get consolidated into an 'I' and an 'F', which makes it easier to use when specifying all of those datatypes in the Item Definition.

### SDL Formats Definition Example

```
{  
    "A": {  
        "doc": "ASCII"  
    },  
    "B": {  
        "doc": "Binary"  
    },  
    "L": {  
        "doc": "List"  
    },  
    "I1": {  
        "doc": "Signed Integer One Byte"  
    },  
    "I2": {  
        "doc": "Signed Integer Two Bytes"  
    },  
    "I4": {  
        "doc": "Signed Integer Four Bytes"  
    },  
    "I8": {  
        "doc": "Signed Integer Eight Bytes"  
    },  
    "F4": {  
        "doc": "Floating Point Four Bytes"  
    },  
    "F8": {  
        "doc": "Floating Point Eight Bytes"  
    },  
    "I": {  
        "doc": "Signed Integer",  
        "formats": [  
            "I1",  
            "I2",  
            "I4",  
            "I8"  
        ]  
    },  
    "F": {  
        "doc": "Floating Point",  
        "formats": [  
            "F4",  
            "F8"  
        ]  
    }  
}
```

## SDL Item Definitions

The SDL Item Definitions list out all possible items that are used in SECS Message definitions. If a SECS Message attempts to use an item that isn't defined in the SDL file, it will throw an error.

### SDL Item Definition Example

```
{  
    "A": {  
        "ACKC7": {  
            "doc": [  
                "ACKC7, Acknowledge Code"  
            ],  
            "formats": [  
                "ACKC7"  
            ]  
        }  
    }  
}
```

```
        "B"
    ],
    "bytes":1,
    "codes":{
        "0":"Accepted",
        "1":"Permission not granted",
        "2":"Length error",
        "3":"Matrix overflow",
        "4":"PPID not found",
        "5":"Mode unsupported",
        "6":"Command will be performed with completion signaled later",
        ">":[
            6,
            "Other error"
        ]
    }
}
```

Each item has a list of properties that define what the item is.

Property Name	Description	Example Formatting
doc	Provides information about what the item is along with any other useful information.	<pre>{   "doc": [     "TIME, Time of day",     "12, 16 bytes, or Extended format as specified by the TimeFormat equipment constant value setting.",     "12-byte format YYMMDDhhmmss",     "16-byte format YYYYMMDDhhmmsscc",     "Extended (max 32 byte) format YYYY-MM-DDThh:mm:ss. sTZD (see SEMI E148)"   ] }</pre>
formats	<p>A list of the possible datatypes that the item can be.</p> <p>Can also be a list of items, as in the second example.</p> <p>The type can be a list of CATTRDATA objects, or any of the other listed objects.</p>	<pre>{   "formats": [     "A",     "B",     "Bool",     "U",     "I"   ] }</pre>
		<pre>{   "formats": [     {       "format": "L",       "item": "CATTRDATA"     },     "B",     "Bool",     "A",     "F",     "U",     "I"   ] }</pre>

bytes	How many bytes the item must have. If bytes is > 1, then the item is an array of bytes. Only applies to single byte datatypes such as Binary, Boolean, U1 and I1.	<pre>{     "bytes":1 }</pre>
codes	Lists possible values an item can have and what each means. A value of ">" means any value greater than the largest code value.	<pre>{     "0": "Accepted",     "1": "Permission not granted",     "2": "Length error",     "3": "Matrix overflow",     "4": "PPID not found",     "5": "Mode unsupported",     "6": "Command will be performed with completion signaled later",     "&gt;": [         6,         "Other error"     ] }</pre>
max	The maximum number of characters that a value can have. Only applies to ASCII datatypes.	<pre>{     "max":40 }</pre>
pattern	A java regular expression that the ASCII value must match. Only applies to ASCII datatypes.	<pre>{     "pattern": "[0-9]{6} [0-9]{8}" }</pre>

## SDL Message Definitions

The message definitions list out all possible SECS messages that will be used when communicating with the equipment. There can be many streams listed, each with multiple functions.

### SDL Message Definition Example

```
{
  "S6F1": {
    "doc": [
      "Trace Data Send",
      "This function sends samples to the host according to the trace setup done by S2,F23."
    ],
    "block": "multiple",
    "direction": "h<-e",
    "or": [
      {
        "reply": true
      },
      {
        "reply": false
      }
    ],
    "CommonID": [
      "TRID"
    ],
    "realtime": true,
    "SQLTags": true,
    "autoReply": {
      "header": {
        "id": "S6F1"
      }
    }
  }
}
```

```

        "stream":6,
        "function":2,
        "reply":false
    },
    "body":{
        "format":"B",
        "value":0
    }
},
"body":[
    "TRID",
    "SMPLN",
    "STIME",
    [
        "SV",
        "..."
    ]
]
}
}

```

Property Name	Description	Example
doc	Provides information about what the message is along with any other useful information.	<pre>{     "doc": [         "Are You There Request",         "Establishes if the equipment is on-line."     ] }</pre>
block	<p>The size in bytes of the entire SECS message. There are two possible values:</p> <ul style="list-style-type: none"> <li>• "single" - The message will not be larger than 254 bytes.</li> <li>• "multiple" - The message will be larger than 254 bytes.</li> </ul> <p>This property is only important for maintaining compatibility with the SECS-I protocol through Serial connection.</p>	<pre>{     "block":"single" }</pre>
direction	<p>Determines whether the message should come from the equipment, the host, or either. Possible values are:</p> <ul style="list-style-type: none"> <li>• "h-&gt;e" - The message goes from the host to the equipment.</li> <li>• "h&lt;-e" - The message goes from the equipment to the host.</li> <li>• "h&lt;-&gt;e" - The message goes either direction.</li> </ul>	<pre>{     "direction":"h&lt;-&gt;e" }</pre>
reply	True if the message expects a reply, false if not.	<pre>{     "reply":true }</pre>
autoReply	<p>An auto response with a given message when a given message is received.</p> <p>If included in a message, the example will auto reply with a S1F2 message.</p>	<pre>{     "autoReply":{         "header":{             "stream":1,             "function":2,             "reply":false         },         "body":[ </pre>

		<pre>         ]     } } </pre>
body	<p>A list of items that the stream will implement.</p> <p>The body list can contain lists of items, or the special "...", which signifies a variable list.</p> <p>In the second example, depending on the value of HCACK, any amount of a list of CNAME and CPACK can be returned.</p>	<pre> {   "body": [     "DATAID",     "DATALENGTH"   ] }  {   "body": [     "HCACK",     [       [         [           "CNAME",           "CPACK"         ],         ...       ]     ]   ] } </pre>
or	Will list multiple possibilities. Can also exist within a body definition.	<pre> {   "or": [     {       "direction": "h-&gt;e",       "body": [         ...       ]     },     {       "direction": "h&lt;-e",       "body": [         "MDLN",         "SOFTREV"       ]     }   ] } </pre>
CommonID	<p>Used to identify certain messages, especially when used to group multiple incoming messages together.</p> <p>In the example, a trace will have multiple S6F1 messages as the status variable is traced over time.</p> <p>The CommonID will use the trace ID to link all messages from the same trace together, allowing for easy retrieval from the database.</p>	<pre> {   "S6F1": {     "doc": [       "Trace Data Send",       "This function sends samples to the host according to the trace setup done by S2_F23."     ],     "block": "multiple",     "direction": "h&lt;-e",     "CommonID": [       "TRID"     ],     "realtime": true,     "SQLTags": true,     "autoReply": {       "header": {         "stream": 6,         "function": 2,         "reply": false       }     }   } } </pre>

		<pre>         }     } } </pre>
realtime	If true, will be processed by a Message Handler script. The message handler must be named onSecsGemRealtimeUpdate. Will use the CommonID for updates. See <a href="#">SECS/GEM Messages</a> for more information on the Message Handler.	<pre> {     "realtime":true } </pre>
SQLTags	If true, will create Tags in the SECSGEM provider automatically, using the CommonID as a folder name. Will create Tags in the location as follows:  SECSGEM->EquipmentNameStream and Function->CommonIDmessage value tags  Can also be overridden to use a folder name other than the CommonID, like in the second example.	<pre> {     "SQLTags":true }  {     "SQLTags":[         "SMPLN"     ] } </pre>

## SDL Message Defaults

The messages section typically starts with a default set of properties before the list of SECS messages. These default property values will be used in the message when the property is not present in the message definition.

SDL Message Defaults
<pre>{   "defaults": {     "doc": [       "Default values for properties that are missing."     ],     "block": "single",     "reply": false,     "direction": "h&lt;-&gt;e",     "body": null   } }</pre>

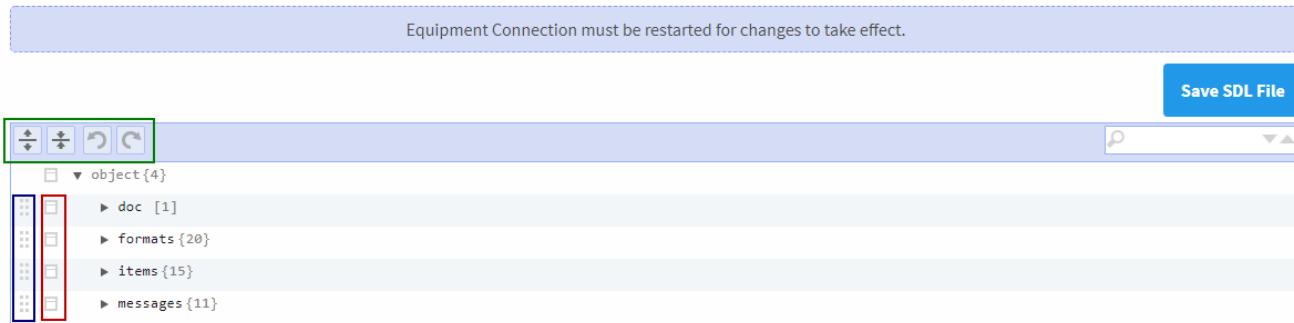
## SDL File Editor

In the **Equipment Connections** section, you can make edits to the equipment's SDL file right in the Gateway Webpage by clicking the **More** button and selecting the **edit sdl file** option.



After editing the SDL file, the equipment connection must be restarted for the changes to take effect.

## EquipmentOne SDL File



Equipment Connection must be restarted for changes to take effect.

Save SDL File

object {4}

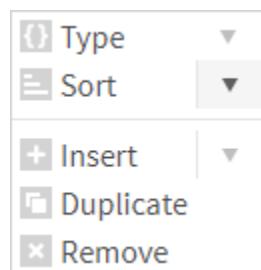
- doc [1]
- formats {20}
- items {15}
- messages {11}

Once in the SDL file editor, there are a few things that can be done. The six dots to the left  of each row circled in blue above, allow you to change the order of the rows by clicking and dragging a row and dropping it in a new spot.

The buttons near the top circled in green apply to the document as a whole:

Button	Description
	Expands all nodes.
	Collapses all nodes.
	Undo the last edit made to the file.
	Redo the last Undo.

Finally, the buttons circled in red  bring up a context menu with a few options that allow you to add and remove rows and change the row type:



Option	Description
Type	Change the type of the row. Possible options are: <ul style="list-style-type: none"><li>• Auto - Automatically determines the type based on the value.</li><li>• Array - Contains an ordered collection of values.</li><li>• Object - Contains an unordered set of key/value pairs.</li><li>• String - Determined from the value, but always returned as a string.</li></ul>
Sort	Sorts the rows in either ascending or descending order. <ul style="list-style-type: none"><li>• Ascending - Sort the children of this array in ascending order.</li><li>• Descending - Sort the children of this array in descending order.</li></ul>
Insert	Inserts a new row before the selected row. Possible types are:

	<ul style="list-style-type: none"> <li>• Auto - Automatically determines the type based on the value.</li> <li>• Array - Contains an ordered collection of values.</li> <li>• Object - Contains an unordered set of key/value pairs.</li> <li>• String - Determined from the value, but always returned as a string.</li> </ul>
Duplicate	Duplicates the row, including all sub elements
Remove	Removes the row and all sub elements.

Each row can be drilled into by clicking on the expand arrow to the left of the element, which allows you to see the sub elements. Many times, these sub elements can also be drilled into to find more sub elements. Once you find the element you want to modify, you can simply edit the text to make a change.



Once all the edits are made, clicking the **Save SDL File** button at the top right of the screen will save your changes. However, the changes won't take effect until the equipment connection is restarted.

## Restart the Equipment

To restart the equipment, simply click the **More** button next to the Equipment on the Equipment Connections page, and select the '**restart**' option.

## Default SDL File

The default '**message.sdl**' file is used when no other SDL file is specified.

### The **messages.sdl** Default File.

```
{
  "doc": ["SECS stream/functions and items are listed and defined in this document."]
}
```

```

"formats": {
    "A": {"doc": "ASCII"}, 
    "B": {"doc": "Binary"}, 
    "B64": {"doc": "Binary encoded as Base64 string"}, 
    "J": {"doc": "JIS-8"}, 
    "L": {"doc": "List"}, 
    "Bool": {"doc": "Boolean"}, 
    "Local": {"doc": "Two Byte Character String"}, 
    "U1": {"doc": "Unsigned Integer One Byte"}, 
    "U2": {"doc": "Unsigned Integer Two Bytes"}, 
    "U4": {"doc": "Unsigned Integer Four Bytes"}, 
    "U8": {"doc": "Unsigned Integer Eight Bytes"}, 
    "I1": {"doc": "Signed Integer One Byte"}, 
    "I2": {"doc": "Signed Integer Two Bytes"}, 
    "I4": {"doc": "Signed Integer Four Bytes"}, 
    "I8": {"doc": "Signed Integer Eight Bytes"}, 
    "F4": {"doc": "Floating Point Four Bytes"}, 
    "F8": {"doc": "Floating Point Eight Bytes"}, 
    "I": {"doc": "Signed Integer", "formats": ["I1", "I2", "I4", "I8"]}, 
    "U": {"doc": "Unsigned Integer", "formats": ["U1", "U2", "U4", "U8"]}, 
    "F": {"doc": "Floating Point", "formats": ["F4", "F8"]}}, 

"items": {
    "A": {
        "ACCESSIONMODE": {
            "doc": ["ACCESSIONMODE, Load Port Access Mode"], 
            "formats": ["U1"], 
            "codes": {
                "0": "Manual", 
                "1": "Auto"}}, 
        "ACKA": {
            "doc": ["ACKA, Indicates success of a request"], 
            "formats": ["Bool"], 
            "codes": {
                "0": "False", 
                "1": "True"}}, 
        "ACKC5": {
            "doc": ["ACKC5, Acknowledge Code"], 
            "formats": ["B"], 
            "bytes": 1, 
            "codes": {
                "0": "Accepted", 
                ">": [0, "Error, not accepted"]}}, 
        "ACKC6": {
            "doc": ["ACKC6, Acknowledge Code"], 
            "formats": ["B"], 
            "bytes": 1, 
            "codes": {
                "0": "Accepted", 
                ">": [0, "Error, not accepted"]}}, 
        "ACKC7": {
            "doc": ["ACKC7, Acknowledge Code"], 
            "formats": ["B"], 
            "bytes": 1, 
            "codes": {
                "0": "Accepted", 
                "1": "Permission not granted", 
                "2": "Length error", 
                "3": "Matrix overflow", 
                "4": "PPID not found", 
                "5": "Mode unsupported", 
                "6": "Command will be performed with completion signaled later", 
                ">": [6, "Other error"]}}, 
        "ACKC10": {
            "doc": ["ACKC10, Acknowledge Code"], 
            "formats": ["B"], 
            "bytes": 1, 
            "codes": {
                "0": "Accepted for display", 
                "1": "Message will not be displayed", 
                "2": "Terminal not available"}}, 
    }
}

```

```

"ALCD": {
    "doc": [ "ALCD, Alarm Code Byte",
        "bit 8 = 1 means alarm set",
        "bit 8 = 0 means alarm cleared",
        "bit 7-1 is alarm category" ],
    "formats": [ "B" ],
    "bytes": 1,
    "codes": {
        "0": "Not Used",
        "1": "Alarm Cleared, Personal Safety",
        "2": "Alarm Cleared, Equipment Safety",
        "3": "Alarm Cleared, Parameter Control Warning",
        "4": "Alarm Cleared, Parameter Control Error",
        "5": "Alarm Cleared, Irrecoverable Error",
        "6": "Alarm Cleared, Equipment Status Warning",
        "7": "Alarm Cleared, Attention flags",
        "8": "Alarm Cleared, Data integrity",
        "><": [ 8, 128, "Alarm Cleared, Other categories" ],
        "128": "Not Used",
        "129": "Alarm Set, Personal Safety",
        "130": "Alarm Set, Equipment Safety",
        "131": "Alarm Set, Parameter Control Warning",
        "132": "Alarm Set, Parameter Control Error",
        "133": "Alarm Set, Irrecoverable Error",
        "134": "Alarm Set, Equipment Status Warning",
        "135": "Alarm Set, Attention flags",
        "136": "Alarm Set, Data integrity",
        ">": [ 136, "Alarm Cleared, Other categories" ] } },
"ALED": {
    "doc": [ "ALED, Alarm Enable/Disable Code" ],
    "formats": [ "B" ],
    "bytes": 1,
    "codes": {
        ">": [ 127, "Enable Alarm" ],
        "<": [ 128, "Disable Alarm" ] } },
"ALID": {
    "doc": [ "ALID, Alarm Identification" ],
    "formats": [ "U" ] },
"ALTX": {
    "doc": [ "ALTX, Alarm Text" ],
    "formats": [ "A" ],
    "max": 120 },
"ATTRDATA": {
    "doc": [ "ATTRDATA, Contains a specific attribute value for a specific object." ],
    "formats": [ { "format": "L", "item": "ATTRDATA" }, "B", "Bool", "A", "F", "U", "I" ] },
"ATTRID": {
    "doc": [ "ATTRID, Identifier for an attribute for a specific type of object." ],
    "formats": [ "A", "U" ] } },
"C": {
    "CAACK": {
        "doc": [ "CAACK, Carrier Action Acknowledge Code" ],
        "formats": [ "U1" ],
        "codes": {
            "0": "Acknowledge, command has been performed",
            "1": "Invalid command",
            "2": "Can not perform now",
            "3": "Invalid data or argument",
            "4": "Acknowledge, request will be performed with completion signaled later by an event",
            "5": "Rejected. Invalid state",
            "6": "Command performed with errors" } } },
"CARRIERACTION": {
    "doc": [ "CARRIERACTION, Specifies the action requested for a carrier" ],
    "formats": [ "A" ] },
"CARRIERID": {
    "doc": [ "CARRIERID, The identifier of a carrier" ],
    "formats": [ "A" ] },
"CATTRDATA": {
    "doc": [ "CATTRDATA, The value of a carrier attribute" ],
    "formats": [ { "format": "L", "item": "CATTRDATA" }, "B", "Bool", "A", "F", "U", "I" ] },
"CATTRID": {

```

```

    "doc": [ "CATTRID, The name of a carrier attribute" ],
    "formats": [ "A" ] },
    "CCODE": {
        "doc": [ "CCODE, Command Code",
            "Each command code corresponds to a unique process operation the machine is capable
of performing." ],
        "formats": [ "A", "I2", "I4", "U2", "U4" ] },
    "CEED": {
        "doc": [ "CEED, Collection event or trace enable/disable code" ],
        "formats": [ "Bool" ],
        "bytes": 1,
        "codes": {
            "0": "Disable",
            "1": "Enable" } },
    "CEID": {
        "doc": [ "CEID, Collected Event ID" ],
        "formats": [ "U" ] },
    "COMMACK": {
        "doc": [ "COMMACK, Establish Communications Acknowledge Code" ],
        "formats": [ "B" ],
        "bytes": 1,
        "codes": {
            "0": "Accepted",
            "1": "Denied, Try Again" } },
    "CPACK": {
        "doc": [ "CPACK, Command Parameter Acknowledge Code" ],
        "formats": [ "B" ],
        "bytes": 1,
        "codes": {
            "1": "Parameter Name (CPNAME) does not exist",
            "2": "Illegal Value specified for CPVAL",
            "3": "Illegal Format specified for CPVAL",
            ">": [ 3, "Other equipment specific error" ] } },
    "CPNAME": {
        "doc": [ "CPNAME, Command Parameter Name" ],
        "formats": [ "A" ],
        "max": 40 },
    "CPVAL": {
        "doc": [ "CPVAL, Command Parameter Value" ],
        "formats": [ "A", "B", "Bool", "U", "I" ] },
    "D": {
        "DATAID": {
            "doc": [ "DATAID, Data ID" ],
            "formats": [ "U" ] },
        "DATALENGTH": {
            "doc": [ "DATALENGTH, Total bytes to be sent" ],
            "formats": [ "U" ] },
        "DRACK": {
            "doc": [ "DRACK, Define Report Acknowledge Code",
                "If an error condition is detected the entire message is rejected (i.e., partial
changes are not allowed.)" ],
            "formats": [ "B" ],
            "bytes": 1,
            "codes": {
                "0": "Accepted",
                "1": "Denied. Insufficient space",
                "2": "Denied. Invalid format",
                "3": "Denied. At least one RPTID already defined",
                "4": "Denied. At least VID does not exist",
                ">": [ 4, "Other errors" ] } },
        "DSPER": {
            "doc": [ "DSPER, Data sample period.",
                "DSPER has two allowable formats:",
                "Format 1: hhmmss, 6 bytes",
                "Format 2: hhmmsscc, 8 bytes",
                "Where hh is hours, mm is minutes, ss is seconds, and cc is centiseconds.",
                "Equipment shall either (1) support only Format 1, or (2) support both Format 1 and
Format 2.",
                "Equipment shall document which formats it accepts.",
                "Equipment which supports Format 2 need not necessarily support a minimum DSPER of 1
centisecond." ] }
    }
}

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        "nor a trace resolution of 1 centisecond, but equipment suppliers shall document its
trace performance limits."],
    "formats": ["A"],
    "pattern": "^[0-9]{6}|[0-9]{8}$"},

"E": {
    "EAC": {
        "doc": ["EAC, Equipment Acknowledge Code"],
        "formats": ["B"],
        "bytes": 1,
        "codes": {
            "0": "Acknowledge",
            "1": "Denied. At least one constant does not exist",
            "2": "Denied. Busy",
            "3": "Denied. At least one constant out of range",
            ">": [3, "Other equipment specific error"]}}},
    "ECDEF": {
        "doc": ["ECDEF, Equipment Constant Default value"],
        "formats": [{"format": "L", "item": "ECDEF"}, "A", "B", "Bool", "J", "F", "U", "I"]}],

"ECID": {
    "doc": ["ECID, Equipment Constant ID"],
    "formats": ["U"]},
    "ECMAX": {
        "doc": ["ECMAX, Equipment Constant Maximum value"],
        "formats": ["A", "B", "Bool", "J", "F", "U", "I"]},
    "ECMIN": {
        "doc": ["ECMIN, Equipment Constant Minimum value"],
        "formats": ["A", "B", "Bool", "J", "F", "U", "I"]},
    "ECNAME": {
        "doc": ["ECNAME, Equipment Constant Name"],
        "formats": ["A"]},
    "ECV": {
        "doc": ["ECV, Equipment Constant Value"],
        "formats": [{"format": "L", "item": "ECV"}, "A", "B", "Bool", "J", "F", "U", "I"]}],
    "EDID": {
        "doc": ["EDID, Expected Data Identification"],
        "formats": ["A", "B", "U", "I"]},
    "ERACK": {
        "doc": ["ERACK, Enable/Disable Event Acknowledge Code"],
        "formats": ["B"],
        "bytes": 1,
        "codes": {
            "0": "Accepted",
            "1": "Denied. At least one CEID does not exist",
            ">": [1, "Other Errors"]}}},
    "ERRCODE": {
        "doc": ["ERRCODE, Code identifying an error"],
        "formats": ["U"],
        "codes": {
            "0": "No error",
            "1": "Unknown object in Object Specifier",
            "2": "Unknown target object type",
            "3": "Unknown object instance",
            "4": "Unknown attribute name",
            "5": "Read-only attribute - access denied",
            "6": "Unknown object type",
            "7": "Invalid attribute value",
            "8": "Syntax error",
            "9": "Verification error",
            "10": "Validation error",
            "11": "Object identifier in use",
            "12": "Parameters improperly specified",
            "13": "Insufficient parameters specified",
            "14": "Unsupported option requested",
            "15": "Busy",
            "16": "Not available for processing",
            "17": "Command not valid for current state",
            "18": "No material altered",
            "19": "Material partially processed",
            "20": "All material processed",
            "21": "Recipe specification related error"}}
}

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        "22":"Failed during processing",
        "23":"Failed while not processing",
        "24":"Failed due to lack of material",
        "25":"Job aborted",
        "26":"Job stopped",
        "27":"Job cancelled",
        "28":"Cannot change selected recipe",
        "29":"Unknown event",
        "30":"Duplicate report ID",
        "31":"Unknown data report",
        "32":"Data report not linked",
        "33":"Unknown trace report",
        "34":"Duplicate trace ID",
        "35":"Too many data reports",
        "36":"Sample period out of range",
        "37":"Group size too large",
        "38":"Recovery action currently invalid",
        "39":"Busy with another recovery currently unable to perform the
recovery",
        "40":"No active recovery action",
        "41":"Exception recovery failed",
        "42":"Exception recovery aborted",
        "43":"Invalid table element",
        "44":"Unknown table element",
        "45":"Cannot delete predefined",
        "46":"Invalid token",
        "47":"Invalid parameter",
        "48":"Load port does not exist",
        "49":"Load port already in use",
        "50":"Missing Carrier",
        "32768":"Action will be performed at earliest opportunity",
        "32769":"Action can not be performed now",
        "32770":"Action failed due to errors",
        "32771":"Invalid command",
        "32772":"Client Alr",
        "32773":"Duplicate ClientID",
        "32774":"Invalid ClientType",
        "32775":"IncompatibleVersions",
        "32776":"Unrecognized ClientID (Client not currently connected)",
        "32777":"Failed (Completed Unsuccess-fully)",
        "32778":"Failed (Unsafe) - External intervention required",
        "32779":"Sensor-Detected Obstacle",
        "32780":"Material Not Sent",
        "32781":"Material Not Received",
        "32782":"Material Lost",
        "32783":"Hardware Failure",
        "32784":"Transfer Cancelled"}},
    "ERRTEXT": {
        "doc": ["ERRTEXT, Text string describing the error noted in the corresponding ERRCODE"],
        "formats": ["A"],
        "max": 120}},
    "G": {
        "GRANT": {
            "doc": ["GRANT, Grant code"],
            "formats": ["B"],
            "bytes": 1,
            "codes": {
                "0": "Permission Granted",
                "1": "Busy, Try Again",
                "2": "No Space Available",
                "3": "Duplicate DATAID",
                ">": [3, "Equipment Specific Error Code"]}}},
    "GRANT6": {
        "doc": ["GRANT6, Permission to send"],
        "formats": ["B"],
        "bytes": 1,
        "codes": {
            "0": "Permission granted",
            "1": "Busy, try again",
            "2": "Not interested",
            ">": [2, "Other err"]}}}

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"H": {
    "HCACK": {
        "doc": [ "HCACK, Host Command Parameter Acknowledge Code" ],
        "formats": [ "B" ],
        "bytes": 1,
        "codes": {
            "0": "Acknowledge, command has been performed",
            "1": "Command does not exist",
            "2": "Cannot perform now",
            "3": "At least one parameter is invalid",
            "4": "Acknowledge, command will be performed with completion signaled later by an event",
            "5": "Rejected, Already in Desired Condition",
            "6": "No such object exists" } },
    "L": {
        "LENGTH": {
            "doc": [ "LENGTH, Length of the service program or process program in bytes." ],
            "formats": [ "U" ] },
        "LRACK": {
            "doc": [ "LRACK, Link Report Acknowledge Code" ],
            "formats": [ "B" ],
            "bytes": 1,
            "codes": {
                "0": "Accepted",
                "1": "Denied. Insufficient space",
                "2": "Denied. Invalid format",
                "3": "Denied. At least one CEID link already defined",
                "4": "Denied. At least one CEID does not exist",
                "5": "Denied. At least one RPTID does not exist",
                ">": [ 5, "Other errors" ] } } },
    "M": {
        "MDLN": {
            "doc": [ "MDLN, Equipment Model Type" ],
            "formats": [ "A" ],
            "max": 20 },
        "MEXP": {
            "doc": [ "MEXP, Message expected in the form SxxFyy where x is stream and y is function." ],
            "formats": [ "A" ],
            "max": 6 },
        "MF": {
            "doc": [ "MF, Material Format code",
                    "Items with format A will be a unit identifier for one of the special SECS generic units, as specified in § 12." ],
            "formats": [ "B", "A" ],
            "bytes": 1,
            "codes": {
                "1": "Quantities in wafers",
                "2": "Quantities in cassette",
                "3": "Quantities in die or chips",
                "4": "Quantities in boats",
                "5": "Quantities in ingots",
                "6": "Quantities in leadframes",
                "7": "Quantities in lots",
                "8": "Quantities in magazines",
                "9": "Quantities in packages",
                "10": "Quantities in plates",
                "11": "Quantities in tubes",
                "12": "Quantities in waterframes",
                "13": "Quantities in carriers",
                "14": "Quantities in substrates" } },
        "MHEAD": {
            "doc": [ "MHEAD, SECS message block header associated with message block in error." ],
            "formats": [ "B" ] },
        "MID": {
            "doc": [ "MID, Material ID" ],
            "formats": [ "B", "A" ],
            "max": 80 } },
    "O": {
        "OBJACK": {
            "doc": [ "OBJACK, Acknowledge code" ],
            "formats": [ "U1" ] }
    }
}

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"codes": {
    "0": "Successful completion of requested data",
    "1": "Error" } },
"OBJSPEC": {
    "doc": [ "OBJSPEC, A text string that has an internal format and that is used to point to a specific object instance.",
        "The string is formed out of a sequence of formatted substrings, each specifying an object's type and identifier.",
        "The substring format has the following four fields:",
        "object type, colon character ':', object identifier, greater-than symbol '>',
        "where the colon character ':' is used to terminate an object type and the \"greater than\" symbol '>' is used to terminate an identifier field.",
        "The object type field may be omitted where it may be otherwise determined.",
        "The final '>' is optional." ],
    "formats": [ "A" ] },
"OBJTYPE": {
    "doc": [ "OBJTYPE, Identifier for a group or class of objects",
        "All objects of the same type must have the same set of attributes available." ],
    "formats": [ "A", "U" ] },
"OFLACK": {
    "doc": [ "OFLACK, Acknowledge code for OFF-LINE request" ],
    "formats": [ "B" ],
    "bytes": 1,
    "codes": {
        "0": "OFF-LINE Acknowledge" } },
"ONLACK": {
    "doc": [ "ONLACK, Acknowledge code for ON-LINE request" ],
    "formats": [ "B" ],
    "bytes": 1,
    "codes": {
        "0": "ON-LINE Accepted",
        "1": "ON-LINE Not Allowed",
        "2": "Equipment Already ON-LINE" } } },
"P": {
    "PARAMNAME": {
        "doc": [ "PARAMNAME, The name of a parameter in a request" ],
        "formats": [ "A" ] },
    "PARAMVAL": {
        "doc": [ "PARAMVAL, The value of the parameter named in PARAMNAME",
            "Values that are lists are restricted to lists of single items of the same format type." ],
        "formats": [ { "format": "L", "item": "PARAMVAL" }, "A", "B", "Bool", "F", "U", "I" ] },
    "PORTACTION": {
        "doc": [ "PORTACTION, tThe action to be performed on a port" ],
        "formats": [ "A" ] },
    "PPARM": {
        "doc": [ "PPARM, Process Parameter" ],
        "formats": [ "A", "Bool", "F", "U", "I" ] },
    "PPBODY": {
        "doc": [ "PPBODY, Process Program Body",
            "The process program describes to the equipment, in its own language, the actions to be taken in processing the material it receives." ],
        "formats": [ "A", "B", "B64", "U", "I" ] },
    "PPGNT": {
        "doc": [ "PPGNT, Process Program Grant status" ],
        "formats": [ "B" ],
        "bytes": 1,
        "codes": {
            "0": "OK",
            "1": "Already have",
            "2": "No space",
            "3": "Invalid PPID",
            "4": "Busy, try later",
            "5": "Will not accept",
            ">": [ 5, "Other error" ] } },
    "PPID": {
        "doc": [ "PPID, Process Program ID",
            "The format used in the PPID will be host dependent.",
            "For internal use of the equipment, the PPID can be treated as a unique B pattern.",
            "If the local equipment is not prepared to display the transmitted code, the display should be in hexadecimal form." ] }
}

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        "formats": [ "A" ],
        "max": 120 },
    "PRJOBID": {
        "doc": [ "PRJOBID, Text string which uniquely identifies a process job" ],
        "formats": [ "A" ] },
    "PRPAUSEEVENT": {
        "doc": [ "PRPAUSEEVENT, The list of event identifiers, which may be sent as an attribute value to a process job." ,
            "When a process job encounters one of these events it will pause, until it receives the PRJobCommand RESUME." ],
        "formats": [ { "format": "L", "item": "CEID" } ] },
    "PRPROCESSTART": {
        "doc": [ "PRPROCESSTART, Indicates that the process resource start processing immediately when ready." ],
        "formats": [ "Bool" ],
        "codes": {
            "0": "Manual Start",
            "1": "Automatic Start" } },
    "PRRECIPEMETHOD": {
        "doc": [ "PRRECIPEMETHOD, Indicates the recipe specification type, whether tuning is applied and which method is used." ],
        "formats": [ "U1" ],
        "codes": {
            "1": "Recipe only",
            "2": "Recipe with variable tuning" } },
    "PRSTATE": {
        "doc": [ "PRSTATE, Enumerated value" ],
        "formats": [ "U1" ] },
    "PTN": {
        "doc": [ "PTN, Material Port number" ],
        "formats": [ "B", "U1" ],
        "bytes": 1 } },

    "R": {
        "RCMD": {
            "doc": [ "RCMD, Remote Command" ],
            "formats": [ "A" ] },
        "RCPPARNM": {
            "doc": [ "RCPPARNM, The name of a recipe variable parameter." ],
            "formats": [ "A" ],
            "max": 256 },
        "RCPPARVAL": {
            "doc": [ "RCPPARVAL, The initial setting assigned to a recipe variable parameter." ],
            "formats": [ { "format": "L", "item": "RCPPARVAL" }, "A", "B", "Bool", "F", "U", "I" ],
            "max": 80 },
        "RCPSPEC": {
            "doc": [ "RCPSPEC, Recipe specifier. The object specifier of a recipe." ],
            "formats": [ "A" ] },
        "REPGSZ": {
            "doc": [ "REPGSZ, Reporting Group Size" ],
            "formats": [ "U" ] },
        "RPTID": {
            "doc": [ "RPTID, Report ID" ],
            "formats": [ "U" ] } },
    "S": {
        "SHEAD": {
            "doc": [ "SHEAD, Stored header related to the transaction timer." ],
            "formats": [ "B" ] },
        "SLOTID": {
            "doc": [ "SLOTID, Used to reference material by slot (a position that holds material /substrates) in a carrier." ,
                "This item may be implemented as an array in some messages." ],
            "formats": [ "U1" ] },
        "SMPLN": {
            "doc": [ "SMPLN, Sample Number" ],
            "formats": [ "U", "I" ] },
        "SOFTREV": {
            "doc": [ "SOFTREV, Software Revision Code" ],
            "formats": [ "A" ],
            "max": 20 },
        "STIME": {

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"doc": ["STIME, Sample Time",
        "12 or 16 bytes, or Extended format as specified by the TimeFormat equipment
constant value setting.",
        "12-byte format: YYMMDDhhmmss",
        "16-byte format: YYYYMMDDhhmmsscc",
        "Extended (max 32 byte) format: format YYYY-MM-DDThh:mm:ss.ssTZD (see SEMI E148)"],
    "formats": ["A"],
    "max": 32},
"SV": {
    "doc": ["SV, Status Variable"],
    "formats": [{"format": "L", "item": "SV"}, {"B", "Bool", "A", "J", "F", "U", "I"}],
    "SVID": {
        "doc": ["SVID, Status Variable ID",
                "Status variables may include any parameter that can be sampled in time such as
temperature or quantity."],
        "formats": ["U"]},
    "SVNAME": {
        "doc": ["SVNAME, Status Variable Name"],
        "formats": ["A"]}},
    "T": {
        "TEXT": {
            "doc": ["TEXT, a single line of characters."],
            "formats": ["A", "B", "Local", "U", "I"]},
        "TIACK": {
            "doc": ["TIACK, Time Acknowledge Code"],
            "formats": ["B"],
            "bytes": 1,
            "codes": {
                "0": "OK",
                "1": "Error, not done"}},
        "TIAACK": {
            "doc": ["TIAACK, Equipment Acknowledgement Code"],
            "formats": ["B"],
            "bytes": 1,
            "codes": {
                "0": "Everything correct",
                "1": "Too many SVIDs",
                "2": "No more traces allowed",
                "3": "Invalid period",
                "4": "Unknown SVID specified",
                "5": "Invalid REPGSZ",
                ">": [63, "Equipment specified error"]}}},
    "TID": {
        "doc": ["TID, Terminal number"],
        "formats": ["B"],
        "bytes": 1,
        "codes": {
            "0": "Single or main terminal",
            ">": [0, "Additional terminals at the same equipment"]}},
    "TIME": {
        "doc": ["TIME, Time of day",
                "12, 16 bytes, or Extended format as specified by the TimeFormat equipment constant
value setting."],
        "formats": [{"format": "YYMMDDhhmmss",
                    "format": "YYYYMMDDhhmmsscc",
                    "format": "Extended (max 32 byte) format YYYY-MM-DDThh:mm:ss.ssTZD (see SEMI E148)"}],
        "max": 32},
    "TOTSMP": {
        "doc": ["TOTSMP, Total Samples"],
        "formats": ["U"]},
    "TRID": {
        "doc": ["TRID, Trace Request ID."],
        "formats": ["U"]}},
    "U": {
        "UNITS": {
            "doc": ["UNITS, Units Identifier"],
            "formats": ["A", "B"]}},
    "V": {
        "V": {

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    "doc": ["V, Variable data"],
    "formats": [{"format": "L", "item": "V"}, {"format": "A", "item": "B"}, {"format": "Bool", "item": "J"}, {"format": "F", "item": "U"}, {"format": "U", "item": "I"}],
    "VID": {
        "doc": ["VID, Variable ID"],
        "formats": [{"format": "U"}]}
    },
    "messages": {
        "defaults": {
            "doc": ["Default values for properties that are missing."],
            "block": "single",
            "reply": false,
            "direction": "h<->e",
            "body": null},
        "S1": {
            "doc": ["Stream 1 Equipment Status",
                    "This stream provides a means for exchanging information about the status of the",
                    "equipment, including its current mode, depletion of various consumable items, and the",
                    "status of transfer operations."],
            "S1F0": {
                "doc": ["Abort Transaction",
                        "Used in lieu of an expected reply to abort a transaction.",
                        "Function 0 is defined in every stream and has the same meaning in every stream."],
                "block": "single", "direction": "h<->e"},
            "S1F1": {
                "doc": ["Are You There Request",
                        "Establishes if the equipment is on-line.",
                        "A function 0 response to this message means the communication is inoperative.",
                        "In the equipment, a function 0 is equivalent to a timeout on the receive timer",
                        "after issuing S1,F1 to the host."],
                "block": "single", "direction": "h<->e", "reply": true,
                "autoReply": {"header": {"stream": 1, "function": 2, "reply": false}, "body": []}},
            "S1F2": {
                "doc": ["On Line Data",
                        "Data signifying that the equipment is alive.",
                        "Exception: The host sends a zero-length list to the equipment."],
                "block": "single",
                "or": [
                    {"direction": "h->e", "body": ["MDLN", "SOFTREV"]},
                    {"direction": "h->e", "body": []}],
            },
            "S1F3": {
                "doc": ["Selected Equipment Status Request",
                        "A request to the equipment to report the values of selected status variables.",
                        "Exception: A zero-length list means report all SVIDs."],
                "block": "single", "direction": "h->e", "reply": true,
                "body": ["SVID", "..."]},
            "S1F4": {
                "doc": ["Selected Equipment Status Data",
                        "The equipment reports the value of each status variable requested in the order",
                        "requested."],
                "block": "multiple", "direction": "h-<-e",
                "body": ["SV", "..."]},
            "S1F11": {
                "doc": ["Status Variable Namelist Request",
                        "A request to the equipment to report the name and units of selected status",
                        "variables."],
                "block": "single", "direction": "h->e", "reply": true,
                "body": ["SVID", "..."]},
            "S1F12": {
                "doc": ["Status Variable Namelist Reply",
                        "The equipment reports to the host the name and units of the requested status"]
            }
        }
    }
}

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variables.",
    "Exception: Zero-length A items for both SVNAME and UNITS indicates that the SVID
does not exist."],
    "block":"multiple","direction":"h<-e",
    "body":[[{"SVID","SVNAME","UNITS"},...]]},

"S1F13":{
    "doc":["Establish Communications Request",
        "The purpose of this message is to establish communication between an equipment
and host at an application level.",
        "The purpose of this message is to provide a formal means of initializing
communications at a logical application level both on",
        "power-up and following a break in communications. It should be the following any
period where host and Equipment SECS",
        "applications are unable to communicate. An attempt to send an Establish
Communications Request (S1,F13) should be repeated",
        "at programmable intervals until an Establish Communications Acknowledge (S1,F14) is
received within the transaction timeout",
        "period with an acknowledgement code accepting the establishment.",
        "Exception: The host sends a zero-length list to the equipment."],
    "block":"single","reply":true,
    "autoReply":{"header":{"stream":1,"function":14,"reply":false},"body":[{"format":"B","value":0},[]]},
    "or":[
        {"direction":"h->e","body":[]},
        {"direction":"h<-e","body":["MDLN","SOFTREV"]}]},

"S1F14":{
    "doc":["Establish Communications Request Acknowledge",
        "Accept or deny Establish Communications Request (S1F13).",
        "MDLN and SOFTREV are on-line data and are valid only if COMMACK = 0.",
        "Exception: The host sends a zero-length list for item 2 to the equipment."],
    "block":"single",
    "or":[
        {"direction":"h<-e","body":["COMMACK",["MDLN","SOFTREV"]]},
        {"direction":"h->e","body":["COMMACK",[]]}]},

"S1F15":{
    "doc":["Request OFF-LINE",
        "The host requests that the equipment transition to the OFF-LINE state."],
    "block":"single","direction":"h->e","reply":true},

"S1F16":{
    "doc":["OFF-LINE Acknowledge"],
    "block":"single","direction":"h<-e",
    "body":"OFLACK"},

"S1F17":{
    "doc":["Request ON-LINE",
        "The host requests that the equipment transition to the ON-LINE state"],
    "block":"single","direction":"h->e","reply":true},

"S1F18":{
    "doc":["ON-LINE Acknowledge"],
    "block":"single","direction":"h<-e",
    "body":"ONLACK"},

"S1F23":{
    "doc":["Collection Event Namelist Request",
        "This function allows the host to retrieve information about what collection event
IDs are available in the equipment",
        "and which data values (DVVALs) are valid for each collection event.",
        "Exception: A zero-length list means send information for all CEIDs."],
    "block":"single","direction":"h->e","reply":true,
    "body":["CEID",...]},

"S1F24":{
    "doc":["Collection Event Namelist",
        "The equipment reports to the host the information of the collection events and
associated VIDs of the CEIDs",
        "requested with the S1F23 message."],

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        "A listed VID can be conditionally or unconditionally associated with the CEID;",
        "it is the responsibility of the equipment supplier to document whether the
conditional VIDs are reported with S1F24.",
        "Exception: When both CENAME and the list of associated VIDs are zero-length items,
this indicates that CEID does not exist."],
        "block":"multiple","direction":"h<-e",
        "body":{["CEID","CENAME",["VID","..."]],"..."}},

    "S2": {
        "doc": ["Stream 2 Equipment Control and Diagnostics",
            "Messages which deal with control of the equipment from the host.",
            "This includes all remote operations and equipment self-diagnostics and calibration but
specifically",
            "excludes the control operations which are associated with material transfer (see Stream
4),",
            "loading of executive and boot programs (Stream 8), and all file and operating system
calls",
            "(Streams 10, 13). See also continuations in Stream 17."],

        "S2F0": {
            "doc": ["Abort Transaction",
                "Used in lieu of an expected reply to abort a transaction.",
                "Function 0 is defined in every stream and has the same meaning in every stream."],
            "block":"single","direction":"h<->e"},

        "S2F13": {
            "doc": ["Equipment Constant Request",
                "A request to the equipment to report the values of selected constants.",
                "Constants such as for calibration, servo gain, alarm limits, data collection mode,
and other values that are changed infrequently can be obtained using this message."],
            "Exception: A zero-length list means report all ECVs according to a predefined
order."],
            "block":"single","direction":"h->e","reply":true,
            "body":{["ECID","..."]},

        "S2F14": {
            "doc": ["Equipment Constant Data",
                "The equipment reports the value of each constant requested in the order requested."],
            "Exception: A zero-length list item for ECV means that ECID does not exist. The list
format for this data item is not allowed, except in this case."],
            "block":"multiple","direction":"h<-e",
            "body":{["ECV","..."]},

        "S2F15": {
            "doc": ["New Equipment Constant Send",
                "Change one or more equipment constants."],
            "block":"single","direction":"h->e","reply":true,
            "body":{["ECID","ECV","..."]},

        "S2F16": {
            "doc": ["New Equipment Constant Acknowledge",
                "Acknowledges or denies modification of equipment constants.",
                "If EAC contains a non-zero error code, the equipment should not change any of the
ECIDs specified in S2F15."],
            "block":"single","direction":"h<-e",
            "body":{["EAC"]},

        "S2F17": {
            "doc": ["Date and Time Request",
                "Get the date and time from the equipment.",
                "Useful to check equipment time base or for equipment to synchronize with the host
time base."],
            "block":"single","direction":"h<->e","reply":true},

        "S2F18": {
            "doc": ["Date and Time Data",
                "Actual time data from equipment."],
            "Exception: A zero-length item means no time exists"],
            "block":"single","direction":"h<->e",
            "body":{["TIME"]},

    }
}

```

```

"S2F23": {
    "doc": ["Trace Initialize Send",
        "Report the current values of selected status variables at a regular interval of time.",
        "Status variables exist at all times. This function provides a way to sample a subset of those status variables as a function of time.",
        "The trace data is returned on S6,F1 and is related to the original request by the TRID Multiple trace requests may be made to",
        "that equipment allowing it. If equipment receives S2F23 with the same TRID as a trace function that is currently in progress",
        "the equipment should terminate the old trace and then initiate the new trace. A trace function currently in progress may be",
        "terminated by S2,F23 with TRID of that trace and TOTSMP = 0.",
        "If S2F23 is multi-block, it must be preceded by the S2F39/S2F40 Inquire/Grant transaction. Some equipment may support",
        "only single-Block S6F1, and may refuse a S2F23 message which would cause a multi-block S6F1.",
        "Each equipment shall document its trace performance limits. The Host Computer shall not send an S2F23 which exceeds the",
        "equipment's performance limits, or the equipment may operate incorrectly.",
        "TRID = Trace Request ID, DSPER = Data Sample Period, TOTSMP = Total samples to be made.",
        "REPGSZ = Reporting Group Size, SVID = Status Variable ID"],
    "block": "multiple", "direction": "h->e", "reply": true, "CommonID": ["TRID"],
    "body": ["TRID", "DSPER", "TOTSMP", "REPGSZ", ["SVID", "..."]]},
}

"S2F24": {
    "doc": ["Trace Initialize Acknowledge"],
    "block": "single", "direction": "h<-e",
    "body": {
        "doc": ["Equipment Acknowledgment Code"],
        "formats": ["B"],
        "bytes": 1,
        "codes": {
            "0": "Everything correct",
            "1": "Too many SVIDs",
            "2": "No more traces allowed",
            "3": "Invalid period",
            "4": "Unknown SVID specified",
            "5": "Invalid REPGSZ",
            ">": [63, "Equipment specified error"]}}},
}

"S2F29": {
    "doc": ["Equipment Constant Namelist Request",
        "A request to the equipment to report information about selected constants.",
        "This function allows the host to retrieve basic information about what equipment constants are available in the equipment.",
        "Exception: A zero-length list means send information for all ECIDs."],
    "block": "single", "direction": "h->e", "reply": true,
    "body": ["ECID", "..."]},
}

"S2F30": {
    "doc": ["Equipment Constant Namelist",
        "The equipment reports to the host information about certain constants.",
        "Exception: Zero-length A items for ECNAME, ECMIN, ECMAX, ECDEF, and UNITS indicates that the ECID does not exist."],
    "block": "multiple", "direction": "h<-e",
    "body": [{"ECID", "ECNAME", "ECMIN", "ECMAX", "ECDEF", "UNITS"}, "..."]},
}

"S2F31": {
    "doc": ["Date and Time Set Request",
        "Set the date and time in the equipment.",
        "Useful to synchronize the equipment time with the host time base."],
    "block": "single", "direction": "h->e", "reply": true,
    "body": "TIME"},
}

"S2F32": {
    "doc": ["Date and Time Set Acknowledge"],
    "block": "single", "direction": "h<-e",
    "body": "TIACK"},
}

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"S2F33": {
    "doc": ["Define Report",
        "The purpose of this message is for the host to define a group of reports for the equipment.",
        "The type of report to be transmitted is designated by a BOOLEAN \"Equipment Constant\".",
        "An \"Equipment Constant Value\" of \"False\" means that an \"Event Report\" (S6F11) will be sent, and a value of \"True\" means",
        "that an \"Annotated Event Report\" (S6F13) will be sent. If S2F33 is Multi-block, it must be preceded by the S2F39/S2F40 Inquire/Grant transaction.",
        "#Exception 1: A list of zero-length following DATAID deletes all report definitions and associated links. See S2F35 (Link Event/Report).",
        "#Exception 2: A list of zero-length following RPTID deletes report type RPTID. All CEID links to this RPTID are also deleted."],
    "block": "multiple", "direction": "h->e", "reply": true,
    "body": [{"DATAID": [{"RPTID": ["VID", "..."]}], "..."}]},
}

"S2F34": {
    "doc": ["Define Report Acknowledge"],
    "block": "single", "direction": "h<-e",
    "body": "DRACK"},

"S2F35": {
    "doc": ["Link Event Report",
        "The purpose of this message is for the host to link n reports to an event (CEID).",
        "These linked event reports will default to 'disabled' upon linking.",
        "That is, the occurrence of an event would not cause the report to be sent until enabled.",
        "See S2F37 for enabling reports.",
        "If S2F35 is Multi-block, it must be preceded by the S2F39/S2F40 Inquire/Grant transaction.",
        "#Exception: A list of zero length following CEID deletes all report links to that event."],
    "block": "multiple", "direction": "h->e", "reply": true,
    "body": [{"CEID": [{"RPTID": "..."}], "..."}]},
}

"S2F36": {
    "doc": ["Link Event Report Acknowledge",
        "If an error condition is detected the entire message is rejected (i.e., partial changes are not allowed.)"],
    "block": "single", "direction": "h<-e",
    "body": "LRACK"},

"S2F37": {
    "doc": ["Enable/Disable Event Report",
        "The purpose of this message is for the host to enable or disable reporting for a group of events (CEIDs).",
        "The reporting for unlisted (CEIDs) is not affected.",
        "Exception: A list of zero length following <CEED> means all CEIDs."],
    "block": "single", "direction": "h->e", "reply": true,
    "body": [{"CEED": ["CEID", "..."]}]}]

"S2F38": {
    "doc": ["Enable/Disable Event Report Acknowledge",
        "If an error condition is detected the entire message is rejected, i.e., partial changes are not allowed."],
    "block": "single", "direction": "h<-e",
    "body": "ERACK"},

"S2F39": {
    "doc": ["Multi-block Inquire",
        "If a S2,F23, S2,F33, S2,F35, S2,F45, or S2,F49 message is more than one block, this transaction must precede the message."],
    "block": "single", "direction": "h->e", "reply": true,
    "body": [{"DATAID": "DATALENGTH"}]},

"S2F40": {
    "doc": ["Multi-block Grant",
        "Grant permission to send multi-block message."],
    "block": "single", "direction": "h<-e",
    "body": "GRANT"},

}

```

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"S2F41": {
    "doc": ["Host Command Send",
        "The Host requests the Equipment perform the specified remote command with the associated parameters."],
    "block": "single", "direction": "h->e", "reply": true,
    "body": [{"RCMD": [{"CPNAME": "CPVAL"}, {"..."}]}],

    "S2F42": {
        "doc": ["Host Command Acknowledge",
            "If command is not accepted due to one or more invalid parameters (i.e., HCACK = 3),",
            "then a list of invalid parameters will be returned containing the parameter name and reason for being invalid."],
        "block": "single", "direction": "h<-e",
        "body": [{"HCACK": [{"CNAME": "CPACK"}, {"..."}]}],

    "S3": {
        "doc": ["Stream 3 Materials Status",
            "The functions of the material status stream are used to communicate information and actions related to material.",
            "including carriers and material-in-process, time-to-completion information, and extraordinary material occurrences."],


        "S3F0": {
            "doc": ["Abort Transaction",
                "Used in lieu of an expected reply to abort a transaction.",
                "Function 0 is defined in every stream and has the same meaning in every stream."],
            "block": "single", "direction": "h<->e"},

        "S3F15": {
            "doc": ["Materials Multi-Block Inquire",
                "This message requests permission to send a multi-block message based upon a maximum length of the total message.",
                "It must be sent prior to sending any multi-block primary message in Stream 3."],
            "block": "single", "direction": "h->e", "reply": true,
            "body": [{"DATAID", "DATALENGTH"}]},


        "S3F16": {
            "doc": ["Materials Multi-Block Grant",
                "This message grants or denies permission to send a multi-block primary message in Stream 3."],
            "block": "single", "direction": "h<-e",
            "body": {"GRANT"},

        "S3F17": {
            "doc": ["Carrier Action Request",
                "This message requests an action to be performed for a specified carrier.",
                "If multi-block, this message must be preceded by the S3F15/F16 transaction.",
                "Exception: If variable list has no items, then no carrier attributes are included.",
                "If CARRIERID is not a zero-length item, then PTN may be omitted (a zero-length item)",
                "ATTRID and ATTRDATA may be substituted for CATTRID and CATTRDATA respectively.",
                "ReticlePodLocationID may be used as one of <CATTRID> when the CARRIERTACTION is PodRelease and the carrier is not at a Load Port."],
            "block": "multiple", "direction": "h->e", "reply": true,
            "body": [{"DATAID", "CARRIERTACTION", "CARRIERID", "PTN", [{"CATTRID": "CATTRDATA"}, {"..."}]}],


        "S3F18": {
            "doc": ["Carrier Action Acknowledge",
                "This message acknowledges the carrier action request.",
                "Exception: If variable list contains no items then no errors exist"],
            "block": "single", "direction": "h<-e",
            "body": [{"CAACK", [{"ERRCODE": "ERRTEXT"}, {"..."}]}],


        "S3F25": {
            "doc": ["Port Action Request",
                "This message requests an action be performed for a port.",
                "Exception: If variable list contains no items, then no parameters are provided."],
            "block": "single", "direction": "h->e", "reply": true,
            "body": [{"PORTACTION", "PTN", [{"PARAMNAME": "PARAMVAL"}, {"..."}]}],


    }
}

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"S3F26": {
    "doc": [
        "Port Action Acknowledge",
        "This message acknowledges the port action request.",
        "Exception: If variable list contains no item then no errors exist."],
    "block": "single",
    "direction": "h<-e",
    "body": [
        "CAACK", [
            ["ERRCODE", "ERRTEXT"], ...
        ]],
}

"S3F27": {
    "doc": [
        "Change Access",
        "The Host requests the Equipment to change the Access Mode for the specified Load Ports.",
        "ACCESSIONMODE specifies the desired Access Mode. PTN specifies a desired Load Port Number.",
        "If variable list contains no items then the command applies to all Load Ports on the equipment.",
        "If any specified port is already in the specified Access Mode, then the Equipment shall accept the command",
        "and toggle all loadports to specified mode.",
        "If the Equipment is unable to change one or more of specified Port(s) to the specified Access Mode",
        "then the Equipment shall accept the command (with appropriate response acknowledgement),",
        "and shall change only the Access Mode of those Port(s) allowed by the equipment",
        "supplying the host with an indication that not all ports were successfully changed."],
    "block": "single",
    "direction": "h->e",
    "reply": true,
    "body": [
        "ACCESSIONMODE", [
            ["PTN", ...]
        ]],
}

"S3F28": {
    "doc": [
        "Change Access Acknowledge",
        "If the command is successful, CAACK = 0, and variable list size = 0.",
        "If the command was successful for some ports, CAACK = 6, and variable list size > 0."],
    "block": "single",
    "direction": "h<-e",
    "body": [
        "CAACK", [
            ["PTN", "ERRCODE", "ERRTEXT"], ...
        ]],
}

"S5": {
    "doc": [
        "Stream 5 Exception Handling",
        "This stream contains messages regarding binary and analog equipment exceptions.",
        "Exceptions are classified into two categories: errors and alarms."],
}

"S5F0": {
    "doc": [
        "Abort Transaction",
        "Used in lieu of an expected reply to abort a transaction.",
        "Function 0 is defined in every stream and has the same meaning in every stream."],
    "block": "single",
    "direction": "h<->e",
}

"S5F1": {
    "doc": [
        "Alarm Report Send",
        "This message reports a change in or presence of an alarm condition.",
        "One message will be issued when the alarm is set and one message will be issued when the alarm is cleared.",
        "Irrecoverable errors and attention flags may not have a corresponding clear message."],
    "block": "single",
    "direction": "h<-e",
    "reply": true,
    "autoReply": {
        "header": {
            "stream": 5,
            "function": 2,
            "reply": false
        },
        "body": {
            "format": "B",
            "value": 0
        }
    },
    "body": [
        "ALCD", "ALID", "ALTX"
    ],
}

"S5F2": {
    "doc": [
        "Alarm Report Acknowledge",
        "Acknowledge or error."],
    "block": "single",
    "direction": "h->e",
    "body": [
        "ACKC5"
    ],
}

"S5F3": {
    "doc": [
        "Enable/Disable Alarm Send",
        "This message will change the state of the enable bit in the equipment.",
        "The enable bit determines if the alarm will be sent to the host.",
        "Alarms which are not controllable in this way are unaffected by this message."],
}

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    "Exception: A zero-length item for ALID means all alarms."],
    "block":"single","direction":"h->e","reply":true,
    "body": [ "ALED", "ALID" ]},

"S5F4": {
    "doc": [ "Enable/Disable Alarm Acknowledge",
        "Acknowledge or error." ],
    "block": "single", "direction": "h<-e",
    "body": "ACKC5" },


"S5F5": {
    "doc": [ "List Alarms Request",
        "This message requests the equipment to send binary and analog alarm information to
the host.", "A zero-length item means send all possible alarms regardless of the state of
ALED." ],
    "block": "single", "direction": "h->e", "reply": true,
    "body": "ALID..." },


"S5F6": {
    "doc": [ "List Alarm Data",
        "This message contains the alarm data known to the equipment.",
        "A zero-length item returned for ALCD or ALTX means that value does not exist." ],
    "block": "multiple", "direction": "h<-e",
    "body": [ [ "ALCD", "ALID", "ALTX" ], "..."] }},


"S6": {
    "doc": [ "Stream 6 Data Collection",
        "This stream is intended to cover the needs of in-process measurements and equipment
monitoring." ],
    "block": "single", "direction": "h<->e" },


"S6F0": {
    "doc": [ "Abort Transaction",
        "Used in lieu of an expected reply to abort a transaction.",
        "Function 0 is defined in every stream and has the same meaning in every stream." ],
    "block": "single", "direction": "h<->e" },


"S6F1": {
    "doc": [ "Trace Data Send",
        "This function sends samples to the host according to the trace setup done by
S2F23." ,
        "Trace is a time-driven form of equipment status.",
        "Even if S6F1 is multi-block, it is not preceded by an Inquire/Grant transaction,
because the Host S2F23 is an implicit grant.",
        "Some equipment may support only single-block S6F1, and may refuse an S2F23 (Trace
Initiate Send) message which would cause a multi-block S6,F1..",
        "Exception: A zero-length STIME means no value is given and that the time is to be
derived from SMPLN along with knowledge of the request.",
        "TRID = Trace Request ID, SMPLN = Sample Number, STIME = Sample Time, SV = Status
Variable Value"],
        "block": "multiple", "direction": "h<-e", "or": [ { "reply": true }, { "reply": false } ],
        "CommonID": [ "TRID" ], "realtime": true, "SQLTags": true,
        "autoReply": { "header": { "stream": 6, "function": 2, "reply": false }, "body": { "format": "B", "value": 0 } },
        "body": [ "TRID", "SMPLN", "STIME", [ "SV", ... ] ] },


"S6F2": {
    "doc": [ "Trace Data Acknowledge",
        "Acknowledge or error." ],
    "block": "single", "direction": "h->e",
    "body": "ACKC6" },


"S6F5": {
    "doc": [ "Multi-block Data Send Inquire",
        "If the discrete data report S6F3, F9, F11, F13 can involve more than one block,
this transaction must precede the transmission." ],
    "block": "single", "direction": "h<-e", "reply": true,
    "autoReply": { "header": { "stream": 6, "function": 6, "reply": false }, "body": { "format": "B", "value": 0 } },
    "body": [ "DATAID", "DATALENGTH" ] },

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"S6F6": {
    "doc": ["Multi-block Grant"],
    "block": "single", "direction": "h->e",
    "body": "GRANT6"},

"S6F11": {
    "doc": ["Event Report Send",
            "Sends a report when an event occurs.",
            "The purpose of this message is for the equipment to send a defined, linked, and
enabled group of reports to the host upon the",
            "occurrence of an event (CEID).",
            "If S6F11 is Multi-block, it must be preceded by the S6,F5/S6,F6 Inquire/Grant
transaction."],
    "Exception: If there are no reports linked to the event a 'null' report is assumed.",
    "A zero-length list for number of reports means there are no reports linked to the
given CEID."],
    "block": "multiple", "direction": "h<-e", "reply": true,
    "CommonID": ["DATAID"], "realtime": true, "SQLTags": ["DATAID", "CEID"],
    "autoReply": {"header": {"stream": 6, "function": 12, "reply": false}, "body": {"format": "B", "value": 0}},
    "body": ["DATAID", "CEID", [{"RPTID": ["V", "..."]}], "..."]},

"S6F12": {
    "doc": ["Event Report Acknowledge"],
    "block": "single", "direction": "h->e",
    "body": "ACKC6"},

"S6F15": {
    "doc": ["Event Report Request",
            "The purpose of this message is for the host to demand a given report group from the
equipment."],
    "block": "single", "direction": "h->e", "reply": true,
    "body": "CEID"},

"S6F16": {
    "doc": ["Event Report Data",
            "Equipment sends reports linked to given CEID to host.",
            "Identical to structure of S6F11.",
            "A zero-length list for number of reports means there are no reports linked to the
given CEID."],
    "block": "multiple", "direction": "h<-e",
    "body": ["DATAID", "CEID", [{"RPTID": ["V", "..."]}], "..."]},

"S6F19": {
    "doc": ["Individual Report Request",
            "The purpose of this message is for the host to request a defined report from the
equipment."],
    "block": "single", "direction": "h->e", "reply": true,
    "body": "RPTID"},

"S6F20": {
    "doc": ["Individual Report Data",
            "Equipment sends variable data defined for the given RPTID to the host."],
    "block": "multiple", "direction": "h<-e",
    "body": ["V", "..."]},

"S7": {
    "doc": ["Stream 7 Process Program Management",
            "The functions in this stream are used to manage and transfer process programs.",
            "Process programs are the equipment-specific descriptions that determine the procedure
to be",
            "conducted on the material by a single piece of equipment.",
            "Methods are provided to transfer programs as well as establish the link between the
process program",
            "and the material to be processed with that program."],

    "S7F0": {
        "doc": ["Abort Transaction"],
        "block": "single", "direction": "h<->e"},

    "S7F1": {
        "doc": ["Process Program Load Inquire",

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        "This message is used to initiate the transfer of a process program or to select
from stored programs.",

        "The message may be used to initiate the transfer of an unformatted process program
(S7F3/S7F4)",

        "or a formatted process program (S7F23/S7F24), (S7F31/S7F32)."],

        "block":"single","direction":"h<->e","reply":true,
        "body":["PPID","LENGTH"]},

"S7F2":{

        "doc":[ "Process Program Load Grant",
        "This message gives permission for the process program to be loaded."],
        "block":"single","directions":"h<->e",
        "body":"PPGNT"},

"S7F3":{

        "doc":[ "Process Program Send",
        "The program is sent.",
        "If S7F3 is multi-block, it must be preceded by the S7F1/S7F2 Inquire/Grant
transaction."],
        "block":"multiple","direction":"h<->e","reply":true,
        "body":["PPID","PPBODY"]},

"S7F4":{

        "doc":[ "Process Program Acknowledge"],
        "block":"single","direction":"h<->e",
        "body":"ACKC7"},

"S7F5":{

        "doc":[ "Process Program Request",
        "This message is used to request the transfer of a process program."],
        "block":"single","direction":"h<->e","reply":true,
        "body":"PPID"},

"S7F6":{

        "doc":[ "Process Program Data",
        "Exception: A zero-length list means request denied."],
        "block":"multiple","direction":"h<->e",
        "body":{"or":{["PPID","PPBODY"],[]}}},

"S7F17":{

        "doc":[ "Delete Process Program Send",
        "This message is used by the host to request the equipment to delete process
programs from equipment storage."],
        "block":"single","direction":"h->e","reply":true,
        "body":["PPID","..."]},

"S7F18":{

        "doc":[ "Delete Process Program Acknowledge"],
        "block":"single","direction":"h-<e",
        "body":"ACKC7"},

"S7F19":{

        "doc":[ "Current EPPD Request",
        "This message is used to request the transmission of the current equipment process
program directory (EPPD)."],
        "block":"single","direction":"h->e","reply":true,
        "body":{}},

"S7F20":{

        "doc":[ "Current EPPD Data",
        "This message is used to transmit the current EPPD."],
        "block":"multiple","direction":"h<-e",
        "body":["PPID","..."]},

"S7F23":{

        "doc":[ "Formatted Process Program Send",
        "This message allows movement of formatted process programs between a piece of
equipment and its host system."],
        "block":"single","direction":"h->e",
        "body":{}}

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        "If S7F23 is multi-block, it must be preceded by the S7F1/F2 Inquire/Grant
transaction."],
        "block":"multiple","direction":"h<->e","reply":true,
        "body":["PPID","MDLN","SOFTREV",[[ "CCODE", ["PPARM", "..."]], "..."]], "..."]},

    "S7F24": {
        "doc": ["Formatted Process Program Acknowledge",
                "Acknowledges reception of a formatted process program at its destination and
whether the process program",
                "was accepted by the interpreter.",
                "A returned status of \"accepted\" by the interpreter means only that the message is
understood.",
                "The validity of the contents of the process program is determined through a
separate transaction (S7F27/S7F28)."],
        "block":"single","direction":"h<->e",
        "body":"ACKC7"},

    "S7F25": {
        "doc": ["Formatted Process Program Request",
                "This message is used by either equipment or host to request a particular process
program from the other."],
        "block":"single","direction":"h<->e","reply":true,
        "body":"PPID"},

    "S7F26": {
        "doc": ["Formatted Process Program Data",
                "This message transfers a process program in response to a request for the PPID.",
                "The values of MDLN and SOFTREV are obtained from the PCD used to generate the
process program.",
                "Exception: A zero length list indicates the request was denied."],
        "block":"multiple","direction":"h<->e",
        "body":["PPID","MDLN","SOFTREV",[[ "CCODE", ["PPARM", "..."]], "..."]]},

    "S9": {
        "doc": ["Stream 9 System Errors",
                "This stream provides a method of informing the host that a message block has been
received",
                "which cannot be handled or that a timeout on a transaction (receive) timer has
occurred.",
                "The messages indicate either a Message Fault or a Communications Fault has occurred
but",
                "do not indicate a Communications Failure has occurred."],

        "S9F0": {
            "doc": ["Abort Transaction",
                    "Used in lieu of an expected reply to abort a transaction.",
                    "Function 0 is defined in every stream and has the same meaning in every stream."],
            "block":"single","direction":"h<->e"},

        "S9F1": {
            "doc": ["Unrecognized Device ID",
                    "The device ID in the message header did not correspond to any known device ID in
the node detecting the error."],
            "block":"single","direction":"h<-e",
            "body":"MHEAD"},

        "S9F3": {
            "doc": ["Unrecognized Stream Type",
                    "The equipment does not recognize the stream in the message header."],
            "block":"single","direction":"h<-e",
            "body":"MHEAD"},

        "S9F5": {
            "doc": ["Unrecognized Function Type",
                    "The equipment does not recognize the function in the message header."],
            "block":"single","direction":"h<-e",
            "body":"MHEAD"},

        "S9F7": {
            "doc": ["Illegal Data",
                    "This message indicates that the stream and function were recognized, but the

```

```

message format was incorrect."],
    "block":"single","direction":"h<-e",
    "body":"MHEAD"},

"S9F9": {
    "doc": ["Transaction Timer Timeout",
        "This message indicates that the host failed to respond to a request within the
expected amount of time. The transaction has been aborted.",
        "It is up to the host to respond to this error in an appropriate manner to keep the
system operational."],
    "block":"single","direction":"h<-e",
    "body":"SHEAD"},

"S9F11": {
    "doc": ["Data Too Long",
        "This message to the host indicates that the equipment has been sent more data than
it can handle."],
    "block":"single","direction":"h<-e",
    "body":"MHEAD"},

"S9F13": {
    "doc": ["Conversation Timeout",
        "Data were expected but none were received within a reasonable length of time.
Resources have been cleared."],
    "block":"single","direction":"h<-e",
    "body": ["MEXP", "EDID"]},

"S10": {
    "doc": ["Stream 10 Terminal Services",
        "The functions of this stream is to pass textual messages between operator terminals
attached to",
        "processing and/or testing equipment and the host. The equipment makes no attempt to
interpret",
        "the text of the message, but merely passes it from terminal keyboard to the host or
from the host to the display of the terminal.",
        "Management of human response times to information displayed on terminals is the
responsibility of the host."],

"S10F0": {
    "doc": ["Abort Transaction",
        "Used in lieu of an expected reply to abort a transaction.",
        "Function 0 is defined in every stream and has the same meaning in every stream."],
    "block":"single","direction":"h<->e"},

"S10F3": {
    "doc": ["Terminal Display, Single"],
    "block":"single","direction":"h->e", "reply":true,
    "body": ["TID", "TEXT"]},

"S10F4": {
    "doc": ["Terminal Display, Single Acknowledge"],
    "block":"single","direction":"h<-e",
    "body": ["ACKC10"]},


"S14": {
    "doc": ["Stream 14 Object Services",
        "The functions in this stream are used for generic functions concerning objects.",
        "including obtaining information about objects and setting values for an object."],

"S14F0": {
    "doc": ["Abort Transaction",
        "Used in lieu of an expected reply to abort a transaction.",
        "Function 0 is defined in every stream and has the same meaning in every stream."],
    "block":"single","direction":"h<->e"},

"S14F9": {
    "doc": ["Create Object Request",
        "This message is used to request an object owner to create an object instance."},

```

```

    "OBJSPEC specifies the object owner.",
    "Exception: If OBJSPEC is a null-length item, no object specifier is provided.",
    "If variable list size = 0, no specific attribute settings are requested for the new
object."],
    "block":"multiple","direction":"h<->e","reply":true,
    "body":[{"OBJSPEC","OBJTYPE",["ATTRID","ATTRDATA"],...}]}}

"S14F10": {
    "doc": ["Create Object Acknowledge",
        "This message is used to acknowledge the success or failure of creating the new
object specified.",
        "If successful, OBJSPEC is the object specifier of the new object.",
        "The list of attributes returned is dependent upon the type of object specified.",
        "Exception: If OBJSPEC is a null-length item, no object was created.",
        "If the attribute list size = 0, then no attributes of the new object are
returned.",
        "If the errors list size = 0, no errors were detected."],
    "block":"multiple","direction":"h<->e",
    "body":[{"OBJSPEC",
        [{"ATTRID","ATTRDATA"},...],
        ["OBJACK", [{"ERRCODE","ERRTEXT"},...}]}]}}

"S16": {
    "doc": ["Stream 16 Processing Management",
        "This stream provides protocol for a set of messages that enable the control of material
processing at equipment and equipment resources."],
    "S16F0": {
        "doc": ["Abort Transaction",
            "Used in lieu of an expected reply to abort a transaction.",
            "Function 0 is defined in every stream and has the same meaning in every stream."],
        "block":"single","direction":"h<->e"}},
    "S16F1": {
        "doc": ["Multi-block Process Job Data Inquire",
            "If any of Processing Management messages are larger than one block, then this
transaction must precede that message."],
        "block":"single","direction":"h->e","reply":true,
        "body": ["DATAID", "DATALENGTH"]}},
    "S16F2": {
        "doc": ["Multi-block Process Job Data Grant",
            "Message to indicate if permission is granted to transmit a multi-block Job Data
message."],
        "block":"single","direction":"h-<e",
        "body": ["GRANT"]},
    "S16F15": {
        "doc": ["PRJobMultiCreate",
            "Use this single message to Create Multiple Process Jobs, each of which may be
unique in its association of material to process recipe.",
            "If multi-block, this message must be preceded by the S16F1/F2 transaction.",
            "Exception: The list for specifying material is empty when no material is specified
for the process job.",
            "The form of data for item 3 depends on the value in MF."],
        "block":"multiple","direction":"h->e","reply":true,
        "body": [{"DATAID", [{"PRJOBID","MF", {"or": [[[{"CARRIERID", ["SLOTID", "..."]}], "..."], [{"MID", "..."}]]}, {"PRRECIPEMETHOD", "RCPSPEC", [[ "RCPPARNM", "RCPPARVAL"], ...]}, {"PRPROCESSSTART", "PRPAUSEEVENT"}]}]}]}},
    "S16F16": {
        "doc": ["PRJobMultiCreate Acknowledge",
            "This message acknowledges the request and reports any errors in the creation of a
process job.",
            "ERRTEXT contains the identifier of process jobs that were not created.",
            "Exception: If the list of errors is empty then no errors exist."],
        "block":"single","direction":"h-<e",
        "body": [{"PRJOBID", "..."}, {"ACKA", [{"ERRCODE", "ERRTEXT"}, ...]}]}},
    "S16F17": {
        "doc": ["RJobDequeue",

```

```

    "Used to remove process jobs from the equipment for jobs that have not begun
processing.",

    "Exception: If the list size = 0, then de-queue all."],
    "block":"single","direction":"h->e","reply":true,
    "body": [ "PRJOBID", "..."]},

    "S16F18": {
        "doc": [ "PRJobDequeue Acknowledge",
            "Acknowledge the request to de-queue and report any errors.",
            "ERRTEXT will contain the identifier of any jobs that were not de-queued.",
            "Exception: If error list size = 0, no errors exist."],
        "block": "single", "direction": "h-<e",
        "body": [ [ "PRJOBID", "..."], [ "ACKA", [ [ "ERRCODE", "ERRTEXT" ], "..."] ] ]},

    "S16F19": {
        "doc": [ "PRGetAllJobs",
            "Requests the equipment to return a list of process jobs which have not completed.",
            "They may be running or waiting to run."],
        "block": "single", "direction": "h->e", "reply": true},

    "S16F20": {
        "doc": [ "PRGetAllJobs Send",
            "Returns the requested list of process jobs.",
            "Exception: If the list of jobs = 0, then no process jobs are running or waiting to
run."],
        "block": "single", "direction": "h-<-e",
        "body": [ [ "PRJOBID", "PRSTATE" ], "..."]]}
    }
}

```

# SECS/GEM Messages

## SECS Message Basics

From the SECS-II standard:

"SECS-II defines the method of conveying information between equipment and host in the form of messages. These messages are organized into categories of activities, called streams, which contain specific messages, called functions."

Each SECS message specifies a stream and a function. Specific SECS messages are often referred to in this format: **S**(number)**F**(number). For example **S1F13** refers to SECS message Stream 1, Function 13.

### Requests and Responses

There are two kinds of messages:

- **Request:** sometimes called the **primary message**. These originate from the **Host**, which in the context of Ignition, is the Ignition Gateway. Requests are odd-number functions, such as S1F1.
- **Response:** sometimes known as a **secondary message**. These originate from the **Equipment**. Responses are even-number functions, such as S1F2

Thus, the Host can send an S1F1 Request, which establishes if the Equipment is on-line. If so, then the Equipment will respond with an S1F2 Response, which signifies that the Equipment is on-line. Each request can only have a single response message, or no response message if none is needed. This Request-and-Response pattern is the basis of the module, and the standard.

## SECS Message Format

Every SECS message is a JSON formatted string, which contains a header. The header contains the stream, function, and if the message expects a response message. Optionally, the SECS message can have a body, which consists of a list of one or more data items. Each data item can also be a list of other data items. This forms the basis for which all SECS messages should look like, regardless of if they are a request or response.

## SECS Message Example

The following is an example of a S1F11 request:

### S1F11 Request Message

```
{  
    "header": {  
        "doc": "Status Variable Namelist Request",  
        "stream": 1,  
        "function": 11,  
        "reply": true  
    },  
    "body": [  
        {  
            "doc": "SVID, Status Variable ID",  
            "format": "U4",  
            "value": 4  
        }  
    ]  
}
```

When making this request from a script, the `sendRequest` function takes in the header values as parameters, with the whole body as another parameter.

### Python - Send an S1F11 request to the Equipment

```
body = [{"format": "U4", "value": 4}]  
  
transactionID = system.secsgem.sendRequest("S1F11", True, body, "Equip4")
```

## On this page ...

- [SECS Message Basics](#)
  - [Requests and Responses](#)
- [SECS Message Format](#)
  - [SECS Message Example](#)
- [SECS Messages through Tags](#)
  - [Example with S2F14 Using the Simulator](#)
- [SECS Messages through Message Handlers](#)
  - [SECS/GEM Message Handler Example](#)
  - [Example with S2F14 Using the Simulator](#)
- [Custom SECS Message Response Handlers](#)

A typical response to the above request would look something like this:

## S1F12 Response Message

```
{  
    "header": {  
        "doc": "Status Variable Namelist Reply",  
        "stream": 1,  
        "function": 12,  
        "reply": false  
    },  
    "body": [  
        [  
            {  
                "doc": "SVID, Status Variable ID",  
                "format": "U4",  
                "value": 4  
            },  
            {  
                "doc": "SVNAME, Status Variable Name",  
                "format": "A",  
                "value": "RandomBinaryData"  
            },  
            {  
                "doc": "UNITS, Units Identifier",  
                "format": "A",  
                "value": "B"  
            }  
        ]  
    ]  
}
```

Each response message would be received using the [getResponse](#) function, which would use the transactionID from the sendRequest call above, and then do something with the response such as printing it.

### Python - Get an S1F12 response from the Equipment

```
response = system.secsgem.getResponse(transactionID, "Equip4")  
  
print response
```

This simple request/response between the Gateway and Equipment forms the basis for communication using the SECS/GEM module. However, there are some other tools that allow you to receive the response message in different ways: through Tags and Message Handlers.

**Note:** In order to send a certain function request, the equipment connection must have that function defined in the [SDL File](#).

## SECS Messages through Tags

Any SECS messages that contain data can be captured in Tags that can then be used within a project. This can be really useful for something like data coming back from tool traces within the S6F1 messages. When properly configured, the system will automatically create the appropriate Tags within the equipment's folder in the SECSGEM Realtime Tag Provider. While the Tags that get created can be bound to components, they cannot be written to and they can't be edited which means no Tag History, no Alarming, etc.

**Note:** If the Gateway is ever restarted those Tags will disappear, so they will need to be recreated.

To have responses generate Tags, the function must be configured to do so within the SDL File. This is done by adding an object called 'SQLTags' with a value of 'true', along with a 'CommonID' array that holds an identifier. The default SDL file is preconfigured to create Tags for S6F1 messages. Sending a S2F23 request with the appropriate trace parameters to the tool will produce Tags based on the response message. With each new S6F1 message that is received, the Tags will update their values. Using the built in simulator, you can easily create Tag values by calling the S2F23 request with the body below.

### Body of an S2F23 request

```

[
{
    "doc": "TRID, Trace Request ID.",
    "format": "U4",
    "value": 1
},
{
    "doc": "DSPER, Data sample period.",
    "format": "A",
    "value": "000002"
},
{
    "doc": "TOT SMP, Total Samples",
    "format": "U4",
    "value": 10
},
{
    "doc": "REPGSZ, Reporting Group Size",
    "format": "U4",
    "value": 1
},
[
    {
        "doc": "SVID Status Variable ID",
        "value": 1,
        "format": "U4"
    },
    {
        "doc": "SVID Status Variable ID",
        "value": 2,
        "format": "U4"
    },
    {
        "doc": "SVID Status Variable ID",
        "value": 3,
        "format": "U4"
    }
]
]

```

## Example with S2F14 Using the Simulator

This example sets up the S2F14 message to create Tags that we can see in the Tag provider. It assumes the equipment connection is made to a simulator with the default SDL file. In order to capture other messages in Tags, the SDL File will need to be configured to allow that. Here, we setup the SDL File to have S2F14 to create Tags.

1. Go to the Gateway Webpage Configure section, and navigate to SECSGEM -> Equipment.
  - a. On the equipment connection, edit the SDL File.
2. Locate the S2F14 message in the list.
  - a. Add "SQLTags" as an Auto type object with a value of "true" directly under the S2F14 root.
  - b. Create an array called "CommonID" directly under the S2F14 root.
    - i. Add "0: ECV" to the CommonID array as an Auto type object.
3. Save the SDL file and restart the equipment connection.
4. Once the equipment connection has been reestablished, send it an S2F13 message with the body below:

### S2F13 Body

```

[
{
    "doc": "ECID, Equipment Constant ID",
    "format": "U4",
    "value": 200
},
{
    "doc": "ECID, Equipment Constant ID",
    "format": "U4",
    "value": 201
}
]

```

```

{
    "doc": "ECID, Equipment Constant ID",
    "format": "U4",
    "value": 203
},
{
    "doc": "ECID, Equipment Constant ID",
    "format": "U4",
    "value": 205
},
{
    "doc": "ECID, Equipment Constant ID",
    "format": "U4",
    "value": 206
},
{
    "doc": "ECID, Equipment Constant ID",
    "format": "U4",
    "value": 207
}
]

```

## SECS Messages through Message Handlers

Similar to how SECS message data can be captured in Tags, they can instead be made to call a custom Python script. To implement a custom Python script, the message will need to call a [Message Handler](#) with the name `onSecsGemRealtimeUpdate`.

### Message Handler Limitations

The Message Handler can only work with message that are allowed to originate on equipment, such as S6F1.

In cases where the message can only be sent from the host, such as S2F33, then the Message Handlers will be unable to respond.

This Message Handler must have that exact name, though a handler can be specified for both the Client Event Scripts and the Gateway Event Scripts. Within the Message Handler, the SECS message will pass in information into the payload object.

Payload Key	Value
CommonID	The common ID of the message.
Equipment	The name of the equipment that the message is coming from.
Direction	The direction of the message.
RequestResponse	If this was from a request or a response.
TxID	The transaction ID of the message.
Reply	If this message expected a reply.
Message	The message contents.

## SECS/GEM Message Handler Example

This script can handle the message in any way such as storing data in the database or writing to Tags. The example below will take the information and create a logger object with it that will then be printed to the console.

### Python - Example of a `onSecsGemRealtimeUpdate` Message Handler

```

# This message handler is very simple in that it will create a logger with the SECS message data that prints
# to the console.

commonID = payload['CommonID']
equipment= payload['Equipment']
direction = payload['Direction']
reqResp = payload['RequestResponse']

```

```

txId = payload['TxID']
reply = payload['Reply']
message = payload['Message']

msg = "CommonID=" + commonID
msg += ", Equipment=" + equipment
msg += ", Direction=" + direction
msg += ", RequestResponse=" + reqResp
msg += ", TxID=" + str(txId)
msg += ", Reply=" + str(reply)
msg += ", Message=" + message
logger = system.util.getLogger("SECSGEM.Gateway.onSecsGemRealtimeUpdate")
logger.info(msg)

```

Once an onSecsGemRealtimeUpdate Message Handler has been specified, it needs to be specified within the Gateway. Within the Gateway Webpage Configure section, the **Module Settings** page under the SECS/GEM header will have Properties to specify which project holds the Gateway Message Handler and which project holds the Client Message Handler. These can be the same project or different projects.

## SECS/GEM Module Settings

Realtime Message Handlers	
Gateway Message Handler Project	<input type="text" value="myProject"/> <p>Specifies a project that must contain a Gateway message handler called 'onSecsGemRealtimeUpdate'. Incoming realtime value updates will send messages to this handler and include the message information in the handler payload. (default:)</p>
Client Message Handler Project	<input type="text" value="myProject"/> <p>Specifies a project that must contain a client message handler called 'onSecsGemRealtimeUpdate'. Incoming realtime value updates will send messages to this handler and include the message information in the handler payload. (default:)</p>

## Example with S2F14 Using the Simulator

This example sets up the S2F14 message to call the Gateway Message Handler that we setup. It assumes the equipment connection is made to a simulator with the default SDL file. In order to capture message with the onSecsGemRealtimeUpdate, the SDL File will need to be configured to allow that. Here we setup the SDL File to have S2F14 to go through the message handler.

1. Create a Gateway Message Handler called **onSecsGemRealtimeUpdate**.
2. Go to the Gateway Webpage Configure section, and navigate to the SECS/GEM ->Module Settings page.
  - a. Specify the project that the Gateway Message Handler was created on in the Gateway Message Handler Project setting.
3. Within the Gateway Webpage Configure section, navigate to SECS/GEM -> Equipment.
  - a. On the equipment connection, edit the SDL File.
4. Locate the S2F14 message in the list.
  - a. Add "realtime" as an Auto type object with a value of "true" directly under the S2F14 root.
  - b. Create an array called "CommonID" directly under the S2F14 root.
    - i. Add "0: ECV" to the CommonID array as an Auto type object.
5. Save the SDL file and restart the equipment connection.
6. Once the equipment connection has been reestablished, send it an S2F13 message with the body below:

S2F13 Body
<pre>[   {     "doc": "ECID, Equipment Constant ID",     "format": "U4",     "value": 200   },   {     "doc": "ECID, Equipment Constant ID",     "format": "U4",     "value": 201   },   {     "doc": "ECID, Equipment Constant ID",     "format": "U4",     "value": 203   } ]</pre>

```

    },
    {
        "doc": "ECID, Equipment Constant ID",
        "format": "U4",
        "value": 205
    },
    {
        "doc": "ECID, Equipment Constant ID",
        "format": "U4",
        "value": 206
    },
    {
        "doc": "ECID, Equipment Constant ID",
        "format": "U4",
        "value": 207
    }
]

```

## Custom SECS Message Response Handlers

For messages that expect a response, the system is setup to automatically send a response based on what is configured in the SDL file. However, a custom response can be created using a Message Response Handler, allowing you to build custom responses completely in the Python scripting language. Only one custom response to a stream function can be configured per equipment connection, but each equipment connection can have multiple custom responses, each to a different stream function. By setting up a custom Message Response Handler for a stream function, the handler will be used for all responses to the specified stream function.

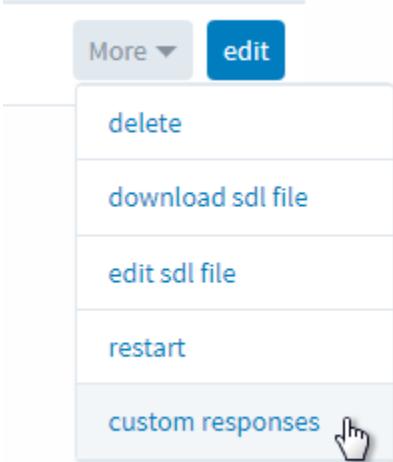
A Message Response Handler is setup on an equipment connection and pointed at a Gateway Event Script Message Handler. Each Message Handler will have a payload object that will contain information from the default message response.

Payload Key	Value
Equipment	The name of the equipment that the message is coming from.
TxID	The transaction ID of the message.
SystemBytes	The system bytes of the response.
Message	The message contents.

Using the data given to us in the payload, the Message Handler can then manipulate it in any way before calling the [system.secsgem.sendResponse](#) function, which will send the response back to the equipment. The response from the custom handler only execute when receiving messages over the HSMS protocol.

Custom response handlers will execute when receiving messages over the SECS-1 (serial) protocol.

Once a Message Handler has been created, the equipment connection needs to specify that it will be using that as a custom message response. To do this, navigate to the Gateway Webpage Configure section, navigate to SECS/GEM -> Equipment. For the equipment connection, click the more button on the right and select the Custom Responses option



On the Message Response Handlers page, we can setup a link between the stream function response we want to intercept and which Message Handler will be used to handle it. Each Message Response Handler has the following settings.

Setting	Description
Enabled	If true, the specified script message handler will be fired when the specified StreamFunction is encountered.
Intercept Stream Function	The SECS stream and function type of the message that will be intercepted. Use a value such as "S6F2"
Gateway Message Handler	The name of the script message handler that will create the SECS response message. This message handler must be created in a project to provide custom responses, and must be a Gateway Event Script message handler.
Project Name	The project that contains the script message handler specified above.

# SECS/GEM Simulator

## Overview

The SECS/GEM Module includes the capability to add and configure equipment simulators. Equipment simulators include basic functionality and have the ability to handle and respond to a number of SECS messages. You can add status variables, equipment constants, reports and collection events to a simulator, allowing you to model a simulator after an existing tool. You can also add hard-coded responses to messages that do not exist in the simulator. These functions allow the simulator to act as a stand-in for tools that do not provide any type of emulator, or only provide one at great cost.

## Simulator SDL File

A simulator is driven from data in its SDL file. This file is the same format as the SDL file used for equipment connections, but it also defines variables, reports, collection events, and hard-coded responses. The simulator SDL file is read when a simulator is started.

You can [modify the simulator SDL file within the Gateway](#). Navigate to Configuration area and click on the SECS/GEM Simulator link. Click on the "sim variables" link next to the simulator you want to modify. The SDL file will be displayed in a tree, allowing you to browse its contents. You can change individual values on an object in the tree. Click the "Save SDL File" button at the top to save any changes you made. You can also click the "Edit Raw SDL File" link to edit the text of SDL file directly. This can be handy when you need to change several objects at once, or see a full view of the SDL file. Click the "Save SDL File" button at the top to save any changes you made. Don't forget to restart the simulator and its equipment connection after you made changes to the SDL file.

## Simulator SDL Utilities

Modifying the simulator SDL file works well for small adjustments, but attempting to create variables, reports and collection events from scratch directly within the SDL file is extremely painful. To eliminate this pain, the Simulator Variables page has a number of [utilities that can automate the creation of these objects](#). Note that after these objects are created, you will still need to modify the simulator SDL file directly to modify or delete the objects.

## Default Messages

By default, the Simulator can respond to the following requests.

- **S1F1** - Are You Online
- **S1F3** - Selected Equipment Status Request
- **S1F11** - Status Variable Namelist Request
- **S1F13** - Establish Communications Request
- **S1F15** - Request OFF-LINE
- **S1F17** - Request ON-LINE
- **S2F13** - Equipment Constant Request
- **S2F15** - New Equipment Constant Send
- **S2F17** - Data and Time Request
- **S2F23** - Trace Initialize Send
- **S2F29** - Equipment Constant Namelist Request
- **S2F31** - Date and Time Set Request
- **S2F33** - Define Report

While the SDL can be modified, note that the Simulator can only respond to the requests listed above: you can add new messages to the simulator's SDL, like S999F1 and S999F2, but the Simulator by default will not respond to any requests using S999F1. If you wish to add new responses, you can create an [Echo Response](#) to simulate a response to any request not listed above. See the [Echo Response](#) section for more details.

The simulator implements the Communications State Model and the Control State Model from the GEM standard (SEMI E30). For example, sending an S1F15 message to a simulator will cause the simulator to move to the OFF-LINE state and will thereafter respond to most messages with S1F0. Sending an S1F17 message to the simulator will move it back into an online state. When control states change, an S6F11 report message is sent with the updated control state. The default startup control states are defined in the simulator SDL file.

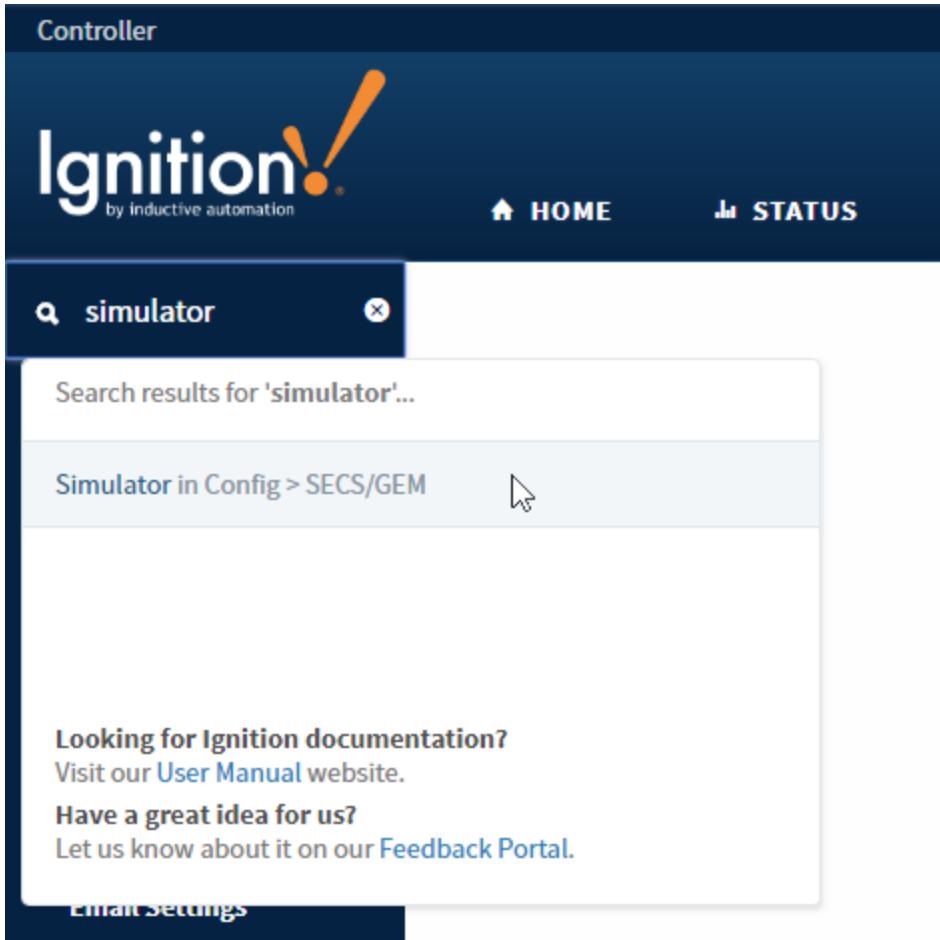
## Configuring a Simulator

The following section details how to configure a SECS/GEM simulator.

1. Navigate to the SECS/GEM Simulator page:
  - From the [Configure](#) section of the Gateway webpage, scroll down the list of links on the left until you see the **SECS/GEM** section. click on the **Simulator** link.
  - Alternatively, use the search bar located in the upper left corner of any page on the Gateway, and search for **simulator**.

## On this page ...

- Overview
  - Simulator SDL File
  - Simulator SDL Utilities
- Default Messages
- Configuring a Simulator
- Simulator Properties



2. Once on the Simulators page, click on the **Create New Simulator** link.
3. From here we can create a new simulator. In the very least, you will need to specify a name for the simulator.
4. If this is the first SECS/GEM simulator device connection, then you can use the default values for the rest of the properties and skip to the next step.  
  
 Subsequent simulators require a different port: two simulators cannot run on the same port. Note that there are multiple port properties.
  - If the **Connection Mode** is set to Active, then the simulator will use the **Active Port**
  - If the **Connection Mode** is set to Passive, then the simulator will use the **Passive Port**
  - If the **Connection Mode** is set to Alternating, then the simulator will try to use either the **Active Port** or **Passive Port**. As the name implies, the connection will attempt to alternate between the Active and Passive settings until a connection is established.
5. Click on the **Create New Simulator** button to save your configuration and create the simulator device. You will see the Simulators page again.
6. Note, that the simulator status will toggle between "Connecting..." and "Not Connected" until you create an [equipment connection](#) that connects to the simulator's IP address and port. Once the Equipment Connection is established, the simulator will report a status of "Communicating". You can then run SECS/GEM commands against the simulator's equipment connection and receive responses.

## Simulator Properties

When configuring a simulator, there are a number of properties that can be configured.

Property Name	Description	Default
Simulator Name	Name of the simulator.	
Simulator Description	A description of the simulator.	
Enabled	Whether the simulator is enabled or disabled. A disabled simulator will prevent communication with the Equipment Connection.	true

Active IP Address	IP Address of Equipment Connection to connect to. Used when simulator is in Active mode.	localhost
Active Port	The Port number of the Equipment Connection to connect to when simulator is in Active mode. When using multiple simulators, the port numbers need to be unique.	5000
Passive IP Address	IP Address of Ignition that the Equipment Connection will connect to when the simulator is in Passive mode.	localhost
Passive Port	Port number that the Equipment Connection will connect to when the simulator is in Passive mode. When using multiple simulators, the port numbers need to be unique.	5000
Device ID	Unique identifier of equipment. Must be an integer.	0
Connection Mode	<p>Method used to connect.</p> <ul style="list-style-type: none"> <li>• ACTIVE - Will attempt to connect to the equipment at the given Active IP Address and Active Port.</li> <li>• PASSIVE - Will listen for a connection from the equipment at the given Passive IP Address and Passive Port.</li> <li>• ALTERNATING - Will switch between Active mode and Passive mode until a connection is made.</li> </ul>	PASSIVE

#### Advanced Properties

T3 Reply Timeout	Specifies the seconds that the simulator will wait for an expected SECS message reply.	45
T5 Connect Separation Timeout	Specifies the seconds which must elapse between successive attempts to connect to an Equipment Connection after disconnection.	10
T6 Control Transaction Timeout	Specifies the seconds which a control transaction (such as LinkTest or Select) may remain open before it is considered a communications failure.	5
T7 Not Selected Timeout	Seconds which a TCP/IP connection can remain in NOT SELECTED state (i.e., no HSMS activity) before it is considered a communications failure. This timeout is only used in Passive mode.	10
T8 Network Intercharacter Timeout	Maximum seconds between successive bytes of a single HSMS message which may expire before it is considered a communications failure. This applies to HSMS messages received from an Equipment Connection.	5

#### Related Topics ...

- [SECS/GEM Equipment Connections](#)
- [Using the SECS/GEM Module](#)

#### In This Section ...

# Additional SECS/GEM Simulator Features

## Default Variables

Each simulator is initialized with a number of status variables and equipment constants for demonstration purposes. The status variables and equipment constants are "live" objects within the simulator. This means that the standard SECS/GEM commands (such as S1F3) can be run to view the variable definitions and current values. Equipment constant values can also be changed using the S2F15 command. See the "Simulator SDL file" section below for information on how to change the values directly in the simulator.

## Import Status Variable Definitions

If you can capture status variable definitions from an existing tool using the S1F11 command, you can automatically create status variables within the simulator. Save your capture to a .txt file with the following format (substitute your own status variables):

```
{
  "body": [
    [
      {
        "doc": "SVID, Status Variable ID",
        "format": "U4",
        "value": 268435456
      },
      {
        "doc": "SVNAME, Status Variable Name",
        "format": "A",
        "value": "LMMode"
      },
      {
        "doc": "UNITS, Units Identifier",
        "format": "A",
        "value": ""
      }
    ],
    [
      {
        "doc": "SVID, Status Variable ID",
        "format": "U4",
        "value": 268435457
      },
      {
        "doc": "SVNAME, Status Variable Name",
        "format": "A",
        "value": "LMState"
      },
      {
        "doc": "UNITS, Units Identifier",
        "format": "A",
        "value": ""
      }
    ]
  ]
}
```

## On this page ...

- [Default Variables](#)
- [Import Status Variable Definitions](#)
- [Import Equipment Constant Definitions](#)
- [Echo Responses](#)
  - [Creating an Echo Response](#)
  - [Example](#)
- [Event Runs](#)
  - [Add Event Runs](#)
  - [Add Events](#)
  - [Using Event Runs](#)
  - [Import Events](#)

On the Simulator Variables page, click on the "Import status variable definitions" link. Choose your text file and click "Begin Import". If there were no errors during import, you will be returned to the Simulator Variables page. You can see your new status variables in the tree under data -> Status Variables or by viewing the raw SDL file. Note that all imported status variables have a format of "UNKNOWN" and a value of "UNKNOWN", due to the fact that the S1F11 command does not send status variable format or value. You must manually set these values before the status variables can be read by the simulator. After the format and value of the new status variables are set, you can save the simulator SDL file, and restart the simulator and its equipment connection. The new status variables will now be readable within the simulator.

## Import Equipment Constant Definitions

If you can capture equipment constant definitions from an existing tool using the S2F29 command, you can automatically create equipment constants within the simulator. Save your capture to a .txt file with the following format (substitute your own equipment constants):

```
{
  "body": [
    [
      {
        "doc": "SVID, Status Variable ID",
        "format": "U4",
        "value": 268435456
      },
      {
        "doc": "SVNAME, Status Variable Name",
        "format": "A",
        "value": "LMMode"
      },
      {
        "doc": "UNITS, Units Identifier",
        "format": "A",
        "value": ""
      }
    ],
    [
      {
        "doc": "SVID, Status Variable ID",
        "format": "U4",
        "value": 268435457
      },
      {
        "doc": "SVNAME, Status Variable Name",
        "format": "A",
        "value": "LMState"
      },
      {
        "doc": "UNITS, Units Identifier",
        "format": "A",
        "value": ""
      }
    ]
  ]
}
```

On the Simulator Variables page, click on the "Import equipment constant definitions" link. Choose your text file and click "Begin Import". If there were no errors during import, you will be returned to the Simulator Variables page. You can see your new equipment constants in the tree under data -> Equipment Constants or by viewing the raw SDL file. Restart the simulator and its equipment connection. The new equipment constants will now be readable within the simulator.

## Echo Responses

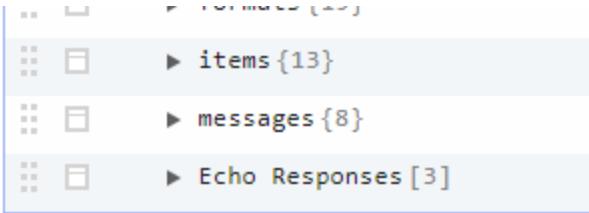
There are a number of SECS/GEM messages that are not implemented in the default simulator. However, you can still use this utility to provide a hard-coded response to these messages.

When creating an Echo Response, you are simply creating a dedicated response to a specified request. Echo Responses can be used to override the responses contained in the Simulator's SDL.

Additionally, you can create an Echo Response to a message that isn't included in the Simulator's Default Messages, allowing you to have the Simulator emulate another tool. In these cases, it you will need to capture the output of an actual tool's response to a message or know the exact format of the response. Furthermore, you will need to modify the Simulator's SDL file to include the message both the request and response.

### Creating an Echo Response

On the Simulator Variables page, click on the **Create echo response** link.



- Import status variable definitions
- Import equipment constant definitions
- Create echo response**
- Event runs

The following properties will appear:

Property Name	Description
Name	The name of the response. Used purely to help you identify specific responses when viewing the responses from the SDL.
Stream and Function	The Stream and Function that this Echo will respond to.
Echo Response	The message to return. If emulating another tool, you will want to modify the Echo Response to match an actual response from the tool.

## Example

1. If you wanted to create a custom response to S1F1, specify Stream 1, Function 1, and use the Message Below

```
{
  "header": {
    "stream":1,
    "function":2,
    "reply":false,
    "doc":"On Line Data"
  },
  "body": [
    {
      "format":"A",
      "value":"SimOne",
      "doc":"MDLN, Equipment Model Type"
    },
    {
      "format":"A",
      "value":"1",
      "doc":"SOFTREV, Software Revision Code"
    }
  ]
}
```

2. Click **Save**
3. Click the **Save SDL File** button
4. Restart the Simulator.
5. Now, whenever the simulator receives an S1F1 message, it will respond with your custom S1F2 message.

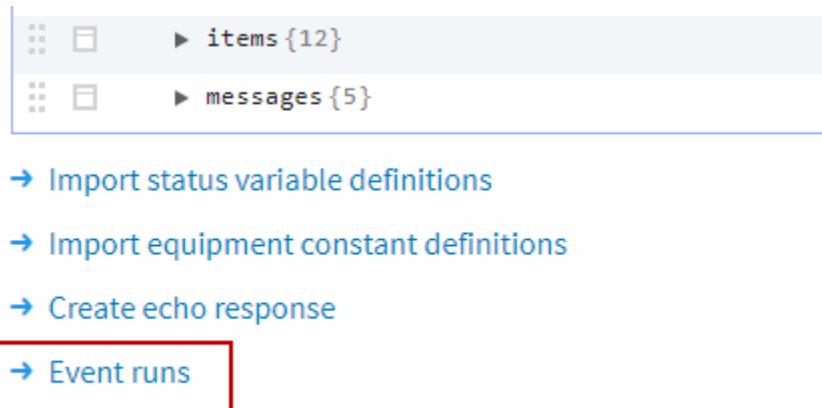
Remember: if you added a new function, you may also need to define the message in the messages section of both the simulator SDL file and the equipment connection SDL file. You may also need to add new format items to the items section of both SDL files. Failure to do so can result in "message not found" or "format not found" errors when you attempt to send the command to the simulator.

## Event Runs

The Simulator features an Event Run feature, which allows you to create a list of S6F11 messages at fixed intervals that simulate report generation. An Event Run consists of one or more events, with each event containing a S6F11 message that will be sent to the simulator when the event fires.

## Add Event Runs

Each simulator can have multiple event runs specified, each with a unique set of events. To access a simulators event runs, go to the Gateway Webpage Configure section and navigate to the SECS/GEM -> Simulator page, and in the **More** menu to the right of the simulator select the **sim variables** option. At the bottom of the SDL editor tool, there will be a link for **Event Runs** that will take you to the page where new event runs can be created.



On the Event Runs page, a new event run can be created by clicking the **Create new Event Run** link, where you can specify the name of the new event run.

## Add Events

Once an event run has been made, new events can be added to it that will execute in order from when the event was started. An event run can have any number of events within it. Events must be from S6F11 messages that have been previously captured, which can be copied from the Messages table in the database. To add a new event, navigate to the Event Runs page and click on the **More** menu to the right of the event run that you wish to add events to. Select the **events** option to navigate to the Events page where you can click on the **Create new Event** link to create a new event in that event run. Each event has a few different properties that can be configured.

Property Name	Description
Event Name	The name of the event.
Index	The index of the event. Note, each event must have a different index in the event run.
Delay	The delay in seconds from the last event until this event fires.
Send Data	A JSON formatted message that will be sent to the equipment connection when the event fires. The message must include header and body fields.

Below is an example of a message for the Send Data property.

### JSON - A Sample Send Data Message for an Event Run

```
{  
  "header":{  
    "stream":6,  
    "function":11,  
    "reply":true,  
    "doc":"Event Report Send"  
  },  
  "body": [  
    {  
      "format":"U4",  
      "value":2,  
      "doc":"DATAID, Data ID"  
    },  
    {  
      "format":"U4",  
      "value":1,  
      "doc":"Event ID"  
    }  
  ]  
}
```

```

        "format": "U4",
        "value": 3,
        "doc": "CEID, Collected Event ID"
    },
    [
        [
            [
                {
                    "format": "U4",
                    "value": 1,
                    "doc": "RPTID, Report ID"
                },
                [
                    [
                        [
                            {
                                "format": "A",
                                "value": "150408103706",
                                "doc": "V, Variable data"
                            },
                            {
                                "format": "A",
                                "value": "OFF-LINE/HOST OFF-LINE",
                                "doc": "V, Variable data"
                            }
                        ]
                    ]
                ]
            ]
        ]
    ]
}

```

## Using Event Runs

To use an event run, it needs to be started. To start an event run navigate to the Event Runs page, and in the **More** menu to the right of the event run you wish to start select the **start** option. If at any time you wish to cancel the event run, simply select the **cancel** option from the **More** menu.

## Import Events

Instead of manually entering in events, multiple events can be imported from previously captured messages in the Messages table. Simply click on the **Import Events** link on the Events page. This will allow you to set up an import with various parameters.

Import Parameter	Description
Datasource	The datasource to pull events from.
Equipment Name	The name of the equipment connection that the events are coming from.
Equipment Table Prefix	The prefix of the specified equipment's database tables.
Range Start	The starting date and time to import events from.
Range End	The ending date and time to import events from.

Once the import parameters have been set up, clicking Begin Import at the bottom will start the import process, which will pull any possible events based on the specified parameters.

# Basic SECS/GEM Troubleshooting

## Equipment Connections

### On Equipment Connection Startup Database Tables Cannot be Created

If you are using MySQL, make sure the latest MySQL JDBC driver is installed in Ignition. If not, you can download it from the MySQL website at <http://dev.mysql.com/downloads/connector/j/>, or from the **Config > Databases > Drivers** section of the Gateway Webpage.

### Unable to Establish Equipment Connection at Setup

If you are unable to create an equipment connection after configuring the connection settings, check the Active and Passive Port numbers. Verify that these port numbers are not being used by another piece of equipment or simulator. Everytime you configure another piece of equipment, the Active and Passive Ports numbers must be unique. They cannot be the same as another piece of existing equipment.

To check the port numbers, go to the **Config > SECS/GEM Equipment** section of the Gateway Webpage. Locate your equipment name, and open the **Equipment Connection** page. Verify that the Active and Passive Port numbers are not being used by another piece of equipment. If so, change the Active and Passive Ports to a unique number, then save your changes. The Equipment Connections page will update, and your equipment will have a status of "Communicating."

## Logging

Each Equipment Connection has a logger associated with it. The Equipment Connection loggers and their severity level can be seen in the **Status** section of the Gateway Webpage under **Diagnostics > Logs**. By default, only messages with a severity level of INFO or more severe such as WARNING or ERROR are logged. A lot of data about what an Equipment Connection is doing can be logged by changing the log level of the Equipment Connection to a less severe level. At the TRACE log level, all SECS messages sent and received by an Equipment Connection are logged.



To change the severity level of a logger, click the **Settings** button to open the Log Configuration window. Locate the logger you want change, and click on the dropdown arrow on the right side of the window. Select the severity you want to update.

Logger	Level
SECSEG.EquipManager	INFO TRACE DEBUG INFO WARN ERROR OFF
SECSEG.EquipmentEditForm	
SECSEG.Equipment[EquipOne]	
SECSEG.Equipment[Equip_MySim]	

## On this page ...

- Equipment Connections
  - On Equipment Connection Startup Database Tables Cannot be Created
  - Unable to Establish Equipment Connection at Setup
- Logging
  - Wrapper.log File
  - Failure to Send a SECS Message

## Wrapper.log File

Messages and log events can be viewed from Ignition's log file called "**wrapper.log**" as well as the Status section of the Gateway Webpage under **Diagnostic > Logs**. If something is not working as expected, it can be very useful to turn on ALL logging for an Equipment Connection and view the wrapper.log file. Often an exception error or log message will explain what is happening.

The file path location of the wrapper.log file is different for each operating system:

- **Windows** - Program Files\ Inductive Automation\Ignition\logs
- **Linux** - /var/log/ignition
- **Mac OS X** - /user/local/ignition/logs

When logging data on Linux it can be useful to run the command `tail -f /var/log/ignition/wrapper.log`. This command displays current log messages on the screen as they occur. A similar tail program can be used on Windows.

## Failure to Send a SECS Message

All SECS messages that are sent and received are validated against the [SECS Definition Language \(SDL\)](#) file. A common reason for failure to send and receive a SECS message is it is either not defined or doesn't match a definition in the SDL file. Any messages that fail to validate against the SDL file will be inserted into the Errors database table for the equipment connection as a validation error along with information about why it didn't validate. If either a sent or received message occurs, a log message describing the problem is written to the wrapper.log file, as well as displayed in the Diagnostic Logs for the equipment connection.

To define or update a SECS message, the SDL file can be edited in the Gateway Webpage from the Equipment Connections page using the built in SDL editor, or downloaded from the Equipment Connections page so it can be edited in a text editor and re-uploaded.

Related Topics ...

- [Diagnostics](#)

# WebDev

The [WebDev module](#) enables you to directly program against the web server inside the Ignition Gateway and systems running Vision Clients. Webpages can be built by hand using a combination of Python programming and static web resources such as images, CSS files, JavaScript files, and HTML files. Likewise, this module allows you to build RESTful web service APIs that allow external systems to interact with the Ignition server. This module follows the normal installation process.

The WebDev Welcome tab allows you to create your program using any of the four types of resources: Python, File, Text and Mounted Folder. Each one of the resource types is a template to help you get started creating your own program. Once you select a resource type, enter a name, and press 'create', and the specific resource template will open. Each resource type will help you get started. The WebDev Welcome tab will show you any recently modified resources along with the date it was modified and who modified it. You can double click on a recently modified query to easily open and update it.

The WebDev Welcome tab provides a quick way to create a new resource and update existing ones.

## On this page ...

- [Resources](#)
- [Mounted Folder](#)
- [Python Resources](#)
  - [Return Value](#)
  - [Parameters](#)
- [URL](#)
- [Right Click Menu](#)
- [Security Settings](#)
  - [Enabled](#)
  - [Require HTTPS](#)
  - [Require Authentication](#)

The screenshot shows the Ignition WebDev Welcome tab. The top navigation bar includes File, Edit, View, Project, Tools, and Help. Below the navigation is a toolbar with various icons. The left sidebar is titled 'Project Browser' and contains a 'Filter' search bar. It lists several project components: Alarm Notification Pipelines, Sequential Function Charts, Scripting, Perspective, Transaction Groups, Vision, Named Queries, Reports, and Web Dev. The 'Web Dev' item is selected and expanded, showing sub-options: FB9083 Tab Strip, File Resource, Mounted Folder, Python, and Text Resource. The main content area has a title 'Web Dev' and a 'Create a New Resource' section. It features a 'Name of the resource' input field and four buttons for 'Python Resource', 'File Resource', 'Text Resource', and 'Mounted Folder'. A 'Create' button is located at the bottom of this section. Below this is a 'Recently Modified Resources' section containing a table with three rows:

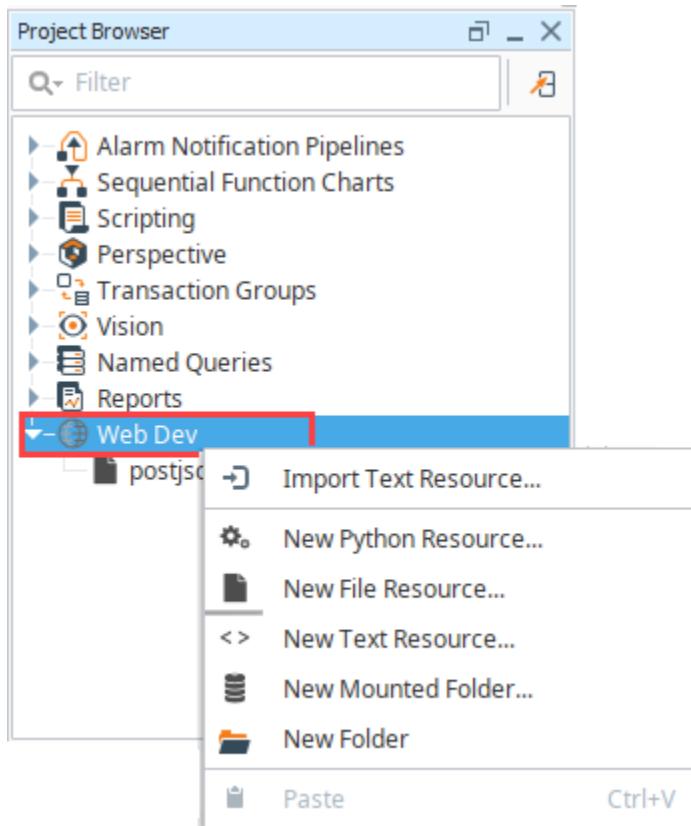
Name	Last Modified	Modified By
Text Resource	Sep 3, 2020, 4:22:17 PM	admin
Python	Sep 3, 2020, 4:22:17 PM	admin
Mounted Folder	Sep 3, 2020, 3:35:59 PM	admin

### Disclaimer

The WebDev module requires specialized web-programming knowledge. The Inductive Automation support team is unable to provide detailed advice about creating a particular site. Furthermore, they are unable to provide troubleshooting beyond the basic functionality of the module.

## Resources

Each type of resource may specify its *content type*. It is important to specify the correct content type for the contents of the resource. When the WebDev module is installed, a new kind of project resource heading will appear in the Designer's project browser called "Web Dev". Right-clicking on this heading will allow the creation of several new types of project resources:



WebDev resources are stored as readable .json and .py files on the Gateway's file system.

- **Python Resource** - Python resources are dynamic web resources. Each time a user browses to the URL associated with a Python resource, the script will run and generate a response in the form of a Python dictionary. See [Return Value](#) for more details on formatting this response.
- **File Resource** - A file resource is a static resource, usually a binary resource such as an image.

**Note:** You will need to re-import a file resource if it has been changed since adding it to WebDev.

- **Text Resource** - A text resource is a static resource much like a file resource, except that its contents may be directly edited from within the Ignition Designer. These are useful for static HTML, CSS, and JavaScript files.

## Mounted Folder

Mounted Folders are a way to expose a folder from the Gateway's hard drive as a resource endpoint. For example, if the Ignition server had some directories that look liked the following:

### Pseudocode - Example Directories

```
/opt/public/a.jpg  
/opt/public/info.html
```

You can create a Mounted Folder named "assets", and point it to `/opt/public/`, and then you can access those assets via:

#### Pseudocode - URL to Mounted Folder

```
http://host:port/system/webdev/projectname/assets/a.jpg
```

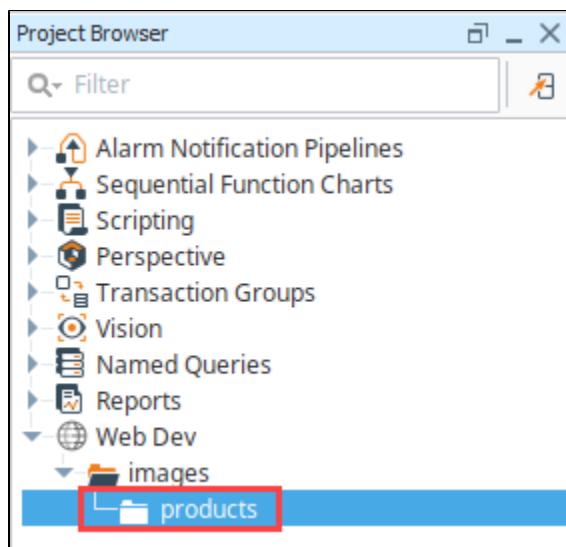
#### URL Encoding

Be mindful of the filenames in the mounted folder, as URL encoding will need to be used to access the file. For example, if a file named "My file.pdf" was placed in the mounted folder above, the space in the file name would likely be encoded to `%20`

```
http://host:port/system/webdev/projectname/assets/My%20file.pdf
```

## Project Resources Folders

If a Mounted Folder is placed in a Project Browser folder, then the endpoint must also include the folder name. For example, if the Mounted Folder named "products" is located in the "images" folder:



The files would be accessible via:

#### Pseudocode - URL for Mounted Folder with Project Resource Folder

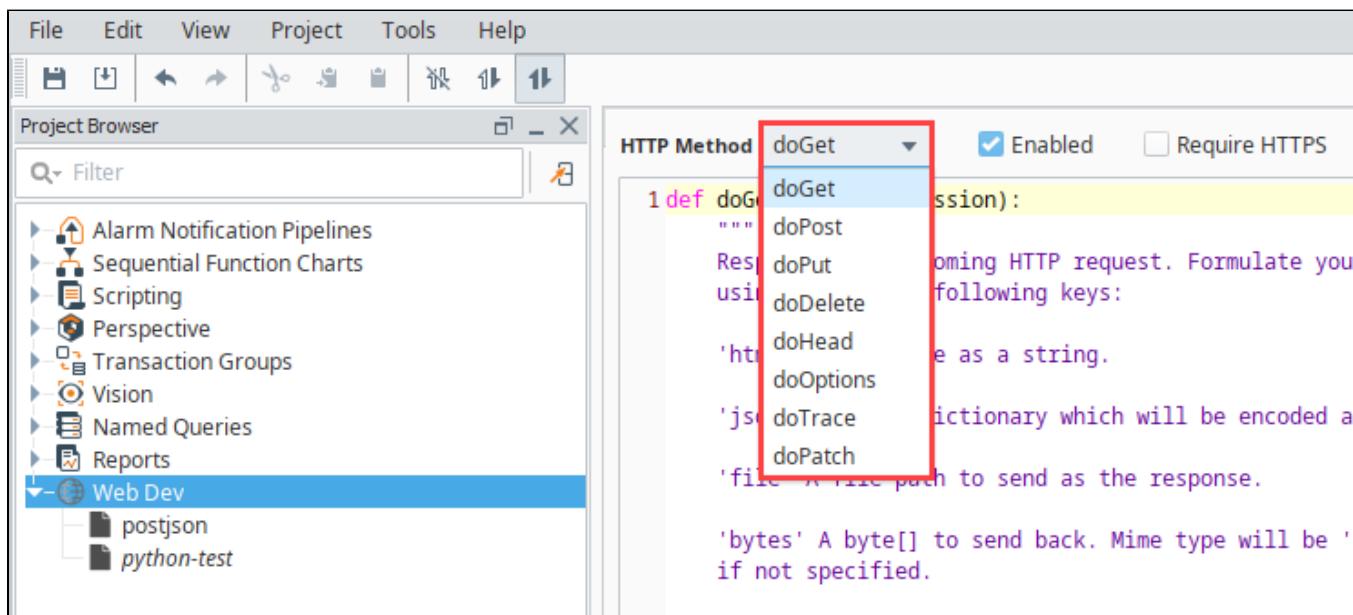
```
http://host:port/system/webdev/projectname/images/products/a.jpg
```

## Python Resources

Python resources are the heart of the functionality of the WebDev module. These resources are completely dynamic, and can handle all parts of the HTTP protocol, formulating any type of response.

Each time an incoming HTTP request arrives at a URL where a Python resource is mounted, the corresponding Python script will be run. Each Python resource can have a script for each HTTP method. In practice, most Python resources will probably only implement one or two of these, usually doGet or doPost at a minimum. The available methods are as follows:

- doGet
- doPost
- doPut
- doDelete
- doHead
- doOptions
- doTrace
- doPatch



## Return Value

Return values for each do\* functions can generate a response, which should always be a dictionary. In the dictionary, the keys in the table below are recognized. The keys are listed here in the order they are evaluated. For example, if you have both file and bytes, only file will take effect. The exception is the contentType key, which may be included with any of the other keys to override the default content type.

HTTP Response	Description
html	HTML source as a string. The value should be a string, which should be the source of an HTML document. Content type is assumed to be text/html.
json	The value is assumed to either be a string (which should be valid json) or to be a Python object, which will then be encoded into a json string. Content type will be application/json.
file	The value should be a string, which should be the path to a file on the server's filesystem. If no contentType is specified, then the system will attempt to probe the content type from the operating system using java.nio.Files.probeContentType. If the file key is present, but the value points to a file that doesn't exist, an HTTP 404 will be returned.
bytes	The value should be a byte array. The default content type is application/octet-stream, but you probably want to specify your own.
response	If none of the other keys are present, the system will look for the key response which will be stringified and then returned with the content type text/plain.
contentType	The mime type of the response. Needed only if ambiguous.

If your implementation of the do\* function returns a dictionary with none of the above keys, an HTTP 500 error will be returned. However, if you return None, no HTTP 500 error will be returned. In this case, it is assumed that you used the request['servletResponse'] parameter to directly formulate your HTTP response.

## Parameters

Each do\* method receives the same two parameters (also called arguments): 'request' and 'session'.

### Request Parameter

The request parameter is a dictionary with information about the incoming web request.

Key	Type	Description
context	object	A reference to the Gateway's context object. This provides direct access to the Ignition GatewayContext. More information about this object may be found in the Ignition <a href="#">SDK Programmer's Guide</a> and associated JavaDocs.
data	plain text or	The data on the request. If the content type is application/json, it will be a Python structure (list or dictionary). If not, it will either be plain text or a raw byte array.

	raw byte array	If the incoming request body was not text, it will be available as a byte array.
postData	string	This parameter is only present for the doPost method, and its value is different based upon the value of the incoming HTTP request's Content-Type header. If the content type is 'application/json', then the request['postData'] will be a Python dictionary structure which is the result of parsing the JSON document that was posted. If the content type starts with 'text', then the value of request['postData'] will be the text which was posted, as a string.
headers	dictionary	A dictionary of header : value pairs. If multiple values were returned for the same header, values will be in a tuple. The HTTP <code>request.headers</code> will be in a dictionary under <code>request['headers']</code> . For example, you could read the User-Agent string with <code>request['headers']['User-Agent']</code> .
params	dictionary	This will be contained in a dictionary accessible via <code>request['params']</code> . Any URL parameters such as the following:  <b>Pseudocode - Request Parameter</b>  <code>/system/webdev/project/foo?param1=value&amp;param2=other_value</code>  For the given example, <code>request['params'] = {'param1': 'value', 'param2': 'other_value'}</code> .
remainingPath	string	<code>request['remainingPath']</code> will be "/bar". Remaining path will be "None" if nothing is found after the resource name. This provides the remaining text after a file resource. If you have a resource called 'foo', and a request is made to:  <b>Pseudocode - Remaining Path</b>  <code>/system/webdev/project/foo/bar</code>
remoteAddr	string	Returns the IP address of the client. Gives the remote IP address of the entity that made the web request.  <b>Note:</b> This is from the perspective of the web server, and so may not be what you expect due to the effects of things like NAT-ing routers.
remoteHost	string	Returns the fully qualified name of the client. Gives the remote host of the entity that made the web request.  <b>Note:</b> This is from the perspective of the web server, and so may not be what you expect due to the effects of things like NAT-ing routers.
scheme	string	The scheme is available via <code>request['scheme']</code> . The value will be 'http' or 'https'.
servletRequest	object	The underlying Java <code>HttpServletRequest</code> object. This parameter and the following <code>servletResponse</code> parameter give you direct access to the underlying Java <code>servlet request</code> and <code>response</code> objects. This provides direct access to the Ignition <code>GatewayContext</code> . More information about this object may be found in the <a href="#">Ignition SDK developer guide</a> and associated JavaDocs.
servletResponse	object	The underlying Java <code>HttpServletResponse</code> object.

## Session Parameter

The session parameter is a Python dictionary which may be used to hold information which persists across multiple different calls to your Web Dev Python Resource, or across multiple Python Resources. Session management is handled automatically, and this dictionary is created for each new client session. (The client must have cookies enabled for sessions to work). You may place any key-value pairs in the session dictionary you'd like, just make sure that the values are things that can be serialized. All normal Python types (scalar, dictionary, lists, and tuples) are serializable.

If authentication is required, will have a 'user' attribute containing information about the authenticated user, and a 'retryAttempts' attribute with the number of attempts made.

## URL

Each resource will be directly accessible over HTTP and mounted beneath the /system/webdev path.

For example, if you created a Text Resource directly beneath the "Web Dev", it would be mounted at:

#### Pseudocode - Project Resource

```
http://host:port/system/webdev/project/resource_name
```

Notice that the project name and resource name are part of the path. If your resource is nested inside a folder, it will be part of the path too. For example:

#### Pseudocode - Folder Resource

```
http://host:port/system/webdev/project/folder_name/resource_name
```

Web Dev resources may have periods in their name. This means that if you upload an image file, you may include its extension directly in its name so that its path is more natural. For example, you might name an image resource "my\_image.png" so that its URL is:

#### Pseudocode - Image Resource

```
http://host:port/system/webdev/project/my_image.png
```

The WebDev module respects the published vs. staging system of Ignition. If your project is set up to have separate staging and published verions, you may access your staging version resources via the URL:

#### Pseudocode - Staging Version Resource

```
http://host:port/system/webdev_staging/project/resource_name
```

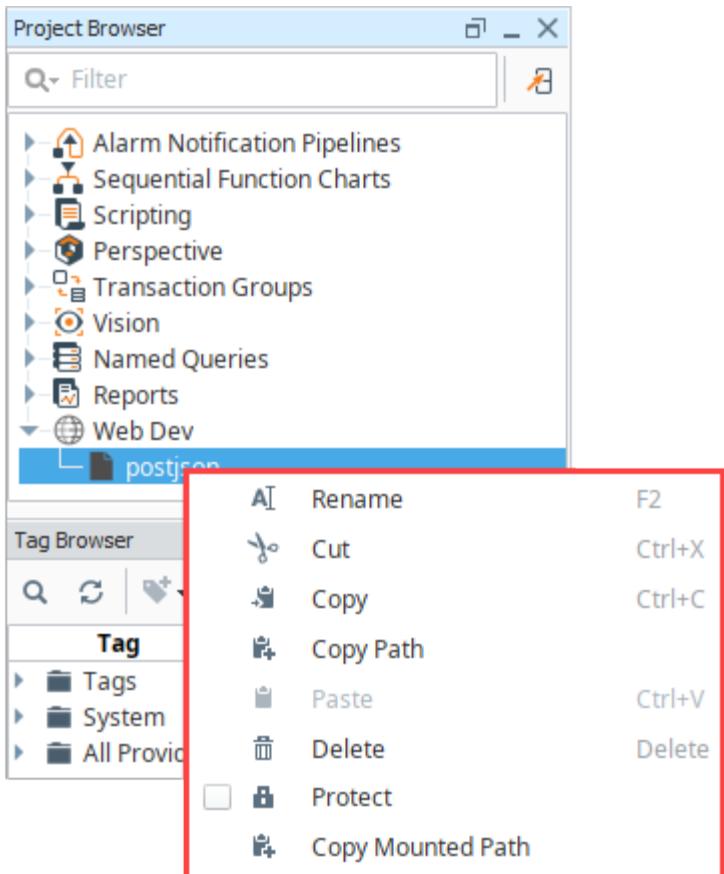
Requests to the root of your project will attempt to load a resource named "index.html". If no such resource exists, a 404 response code will be returned instead.

#### Pseudocode - Request to Root Project

```
http://host:port/system/project
```

## Right Click Menu

The Webdev Right Click menu is similar to other applications edit menus in that it provides basic copy/paste functionality. Options are described in the following table.



Option	Description
Rename	To rename a resource, select this option then enter a new name.
Cut	Cuts the selected resource onto the clipboard.
Copy	Copies the selected resource onto the clipboard. It can then be pasted within the Web Dev make a duplicate.
Copy Path	Copies the path of the selected resource onto the clipboard. For example, "newfile.html".
Paste	Pastes the the selected resource from the clipboard into the selected context.
Delete	Deletes the current selection. This can also be done using the delete key.
Protect	Locks the individual project resource from inside the Designer.
Copy Mounted Path	This copies the partial mounted path for the resource into your clipboard. This allows you to easily paste the path into your browser for testing. For example,"/system/webdev/MyProject/newfile.html". You need to add the path to your gateway to the beginning of this string. A full url would look like: "http://10.10.10.150:8088/system/webdev/MyProject/newfile.html"

## Security Settings

There are several security settings for Python Resources. All of the settings can be set individually on each resource.

### Enabled

If **Enabled** is checked, then the HTTP Method is enabled.

### Require HTTPS

If this is checked, then the resource will only be accessible via an SSL connection. If a non-secure HTTP transport is used, the browser will be sent a redirect to the the Gateway's SSL port. The Gateway must have SSL enabled, of course.

## Require Authentication

If this is checked, the resource will require authentication before it executes. This uses HTTP BASIC auth, and so should really be combined with the Require HTTPS option so that the credentials are encrypted. The username/password combination sent through the HTTP BASIC authentication headers will then be passed through the chosen User Source. If roles are specified, the user must have at least one of the roles. Specify multiple acceptable roles using a comma separated list. If the credentials are missing, an HTTP 401 will be returned with the WWW-Authenticate header. If the credentials are present but incorrect, an HTTP 403 will be returned.

If the credentials succeed, the Python resource will execute. In addition, the authenticated user object returned by the User Source will be accessible inside the session object as `session['user']`. Since the user is stored in session, if the client has cookies enabled, then further requests against the same session will use the stored user object and will not require additional authentication.

### Related Topics ...

- [Web Services, SUDS, and REST](#)
- [HTTP Methods](#)
- [Installing or Upgrading a Module](#)
- [Managing Users and Roles](#)

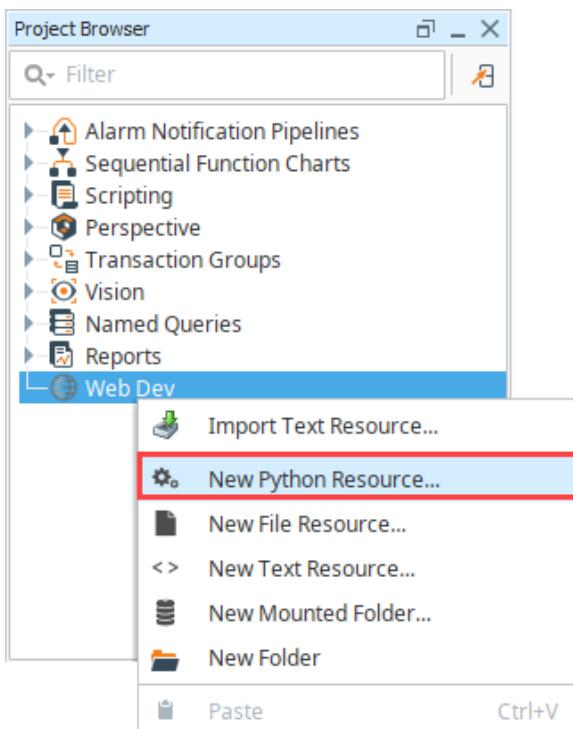
### In This Section ...

# httpPost

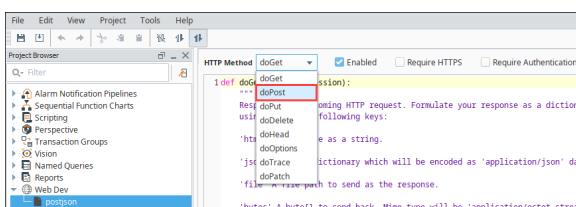
## httpPost Example

This example demonstrates how to allow Ignition to receive data from an external source. It uses a button to send JSON data through an httpPost command and a Python Resource in the [Web Dev module](#) to receive the post and do something with the data. This button example is for testing purposes only, the common use-case for posting data is to use another program to post data.

1. Open the Designer and right-click on the Web Dev object in the Project Browser. Select New Python Resource.



2. Name the Python resource **postjson**.
3. Select the doPost HTTP method from the dropdown in the upper left.



4. Select the **Enabled** option.
5. Copy this code into the doPost function.

### "postjson" Python Resource (Web Dev Section)

```
# take in some JSON data and print it
# expecting 'names' and 'values' that are of the same length

# get the incoming parameters
data = request['postData']
names = data['names']
values = data['values']
# this will print to the wrapper.log file
print names, values
```

## On this page ...

- [httpPost Example](#)

```

# format the string into HTML
formattedString = "<html><body>"
# loop through and add names and values
for i in range(len(names)):
    formattedString += "%s: %s, " %(names[i], values[i])
# remove the last ', ' and add closing html
formattedString = formattedString[:-2]+"</body></html>"
# this will print to the wrapper.log file
print formattedString

# return the value string
return {'html': formattedString}

```

6. Create a button on a window to test the above code. Copy the code below into your button. Make sure to change the **ProjectName** variable to the name of your project. If you used any name other than "postjson" for step 1, change the **doPostName** variable as well.

#### Call Web Service (Button component on a window)

```

# post data to the web service in a json format
# this allows you to use the 'postData' object in the Python Resource

# create url to post to
projectName = "MyProject"
doPostName = "postjson"
url = "http://localhost:8088/main/system/webdev/%s/%s" %
(projectName, doPostName)
# create the dictionary of parameters to pass in
params = {}
params['names'] = ['String','Integer']
params['values'] = ['Hello World', 42]
# encode dictionary to JSON
jsonParams = system.util.jsonEncode(params)

# post to Ignition
postReturn = system.net.httpPost(url,'application/json',jsonParams)
# print return value
print postReturn

```

7. Now test your button. Make sure to open the console to see the print out, or the wrapper.log file to see any errors caused by the doPost function.

#### Related Topics ...

- [Diagnostics](#)

# Ignition Platform

## Overview

The Ignition platform refers to the core installation of Ignition. It provides all the basic functionalities such as connecting to devices and databases, licensing, launching clients and sessions, managing all Ignition modules, and more.

From that, additional modules or projects can be built to suit any customer's needs. Being cross-platform means that a piece of software like Ignition can be installed on multiple types of operating system such as Windows, Linux, and OSX. With its modular architecture, the Ignition platform enables you to build a customized system using modules as the building blocks. Modules are discussed in detail in the [Ignition Modules](#) section of the User Manual.

The following are key elements to the Ignition Platform. Follow the links for more detailed information on each area.

Feature	Description
Gateway	The Ignition Gateway is a web server, and when it is running, you access it from a web browser. In your web browser, type <a href="http://localhost:8088">http://localhost:8088</a> to display the Gateway homepage. The Gateway Webpage is the hub for accessing all the functions of the Gateway server.
Database Connections	Connecting Ignition with an SQL database dramatically increases functionality. With a database, you can implement logging of data for historical analysis, tap into your data to discover trends and performance, create charts and reports, store Tag data, and store alarm logs.
Security	Security options in Ignition provide many ways to safeguard your data and applications. You control not only who accesses your systems, but when and where they can access them.
Designer	In Ignition Designer, your user interface design work is done. You create user interfaces with <a href="#">Vision components</a> or <a href="#">Perspective components</a> . Tags associated with components can instantly bind data to tables, charts, graphs, and more.
Tags	Tags are points of data and may have static values or dynamic values that come from an OPC address, an expression, or a SQL query. Tags offer a great amount of power in system design and configuration.
Alarming	Alarming enables you to easily create alarms, store alarm history, design and manage your alarm notifications, and more.
Localization and Languages	With Localization you can translate text into multiple languages in a project for display on client screens. The localization feature allows users located in different countries to set their default language so client screens can be displayed in their native language.
Expression Language and Syntax	The expression language is used to define dynamic values for component properties and expression Tags. Expressions often involve one or more other values that are used to calculate a final value. In most cases, expressions only return a value.
SQL in Ignition	Ignition's ability to connect to databases greatly increases the functionality available to you. You can use databases to store history, create easy to search lists and configurations, and retrieve data from ERP or other systems.
Scripting	Most of the time when we talk about "scripting" in Ignition we are talking about Python scripting, or writing code in the Python language. Python is a general purpose programming language that was developed in the early 90s and has gained significant popularity in the 2000s. We like it because it is extremely readable, elegant, powerful, and easy to learn. As an added bonus, it gracefully interacts with Java, giving programmers an extremely powerful tool when paired with Ignition, which is written in Java.

## Modular Architecture and Software Stack

Ignition platform has a modular architecture. Modules are software applications that are built and integrated into the platform to offer additional functionality. The modules are similar to applications for a smartphone in how they are seamlessly integrated and provide additional capabilities.

Most of the main features of Ignition are actually provided by different modules such as the [Perspective](#), [Vision](#), and [SQL Bridge](#) modules.

The Ignition software stack is shown in the illustration below. You can see that the HMI/SCADA/MES module layers are built on the Ignition platform. Here are the different software layers in Ignition's modular architecture:

- **Operating System (OS) Layer**  
Provides basic computing resources such as the file system and access to the network.
- **Platform Layer**  
Provides all the basic functionalities such as connecting to devices and databases, licensing, launching clients, managing all Ignition modules over the web, and more.
- **HMI/SCADA Module Layer**  
Provides the core modules that enable real-time and historical data access, trends, and control.

- **Third-Party Module Layer**

Additional modules provided by Strategic Partners and other developers to further extend Ignition's capabilities.

- **User Created Application Layer**

The resulting project created for your organization. Developed internally, or by a third-party.



In This Section ...

# Gateway

The Ignition Gateway is the primary software service that drives everything in Ignition. It is a single application that runs as a web server and is accessed through a web browser. It connects to data and PLCs, executes modules, communicates with clients, and much more. You can customize the Homepage to fit your needs using the Gateway settings. From the Gateway, you activate Ignition, transfer licenses, backup and restore the Ignition Gateway, setup redundancy, and more. You can even set up a Gateway Network that allows two or more Gateways to connect to one another and share data.

## Accessing the Gateway

The Gateway is accessed through a web browser (via the Gateway Web Interface). The web browser, running on any machine, must have network access to the host that is running the Gateway.

By default, Ignition installs by using the 8088 port. For example, if the host's IP address is 10.0.28.30, you access the Gateway via the URL: <http://10.0.28.30:8088>. When Ignition is installed on the computer that you are logged into, you can access it by typing <http://localhost:8088> to display the Gateway Homepage. Any other computer on the same network can access the Gateway by using the IP Address or Host Name of the computer where Ignition is installed: i.e., <http://192.#.#.#:8088>, and it will launch the Gateway and bring up the Gateway Homepage.

## Gateway Web Interface (Gateway Webpage)

The Gateway Webpage performs a cadre of functions and is the hub for accessing all the functions of the Gateway server. It drives everything in Ignition! The Gateway Webpage is where you setup your licensing and activation, configure your Gateway settings, databases, devices, projects, modules, security, alarming, and much more. When the Gateway server is running, you can connect to a device, connect to a database, launch the Designer, and launch a Vision client or Perspective session. You can also check the status of your system, network, agents, sessions, tasks, reports, alarms, and much, much more.

The Gateway Webpage has three tabs on the left side of the page that lead you to the key sections of the server: [Home](#), [Status](#), and [Config](#). The top of the page shows you the path of where you are on the Gateway Webpage. You can perform a host of Gateway functions from configuring your system and modules, checking the status of all your Gateway connections, to launching clients and sessions, and many tasks in between. You can even redirect the Gateway Homepage to display another URL.

### Home

The first time you go to the [Gateway Homepage](#), it shows you several steps to help you get started. Once you're up and running, the [Home](#) tab lets you open Vision clients, Perspective sessions, and download the Designer Launcher. There are some resource links to help you get started with Ignition quickly: [Inductive University](#), [Production Documentation](#) where you can learn about Ignition modules, and the Appendix which contains a complete reference for [components](#), [expressions](#) and [scripting functions](#).

When you're first introduced to Ignition, the Homepage is the landing page. It's where you'll find the [Designer Launcher](#), [Vision Client Launcher](#), and [Perspective Session Launcher](#).

- The [Designer Launcher](#) locates all Gateways that are available on your local network. Once you open the Designer, you can access existing projects or create new projects on the Gateway.
- The [Vision Client Launcher](#) opens Vision Clients from any Ignition Gateway. It browses all Gateways for Vision projects that are available on your local network and remote locations. Once your Vision projects are added to the Vision Client Launcher, they will be displayed and all you have to do is click the link to launch a Vision Client.
- The [Perspective Sessions Launcher](#) opens a session directly in your browser or you can download the native application.

## On this page ...

- [Accessing the Gateway](#)
- [Gateway Web Interface \(Gateway Webpage\)](#)
  - [Home](#)
  - [Status](#)
- [Designer Launcher](#)
- [Starting and Stopping the Gateway](#)
- [Gateway Command-line Utility](#)
- [Gateway Architecture](#)



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### The Gateway Webpage

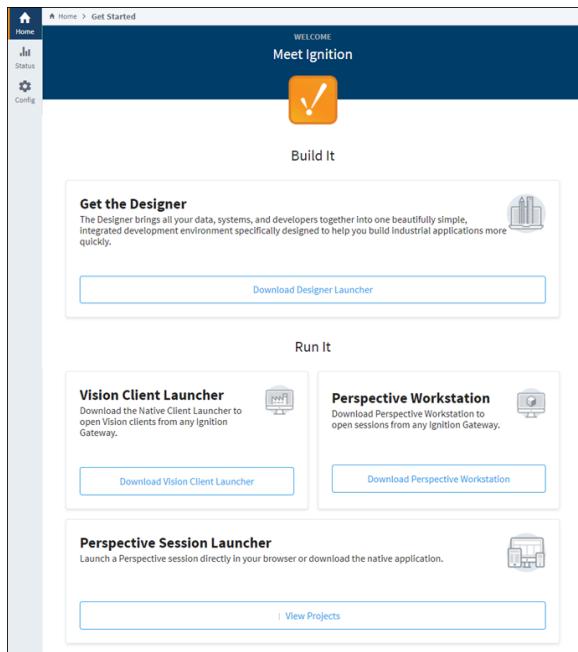
[Watch the Video](#)



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### Customizing the Gateway Homepage

[Watch the Video](#)



## Status

The **Status** page provides in-depth information about the status of the different parts of the Ignition system. The list of options on the left menu in the Status page changes based on what modules are installed. You can select any of the available options to get more detailed information.

**Architecture**

**Gateway | Controller**  
Version: 8.0.0-beta0 (b2019031407)  
License: licensed  
Uptime: 2 hours

**No Redundancy**  
Add a redundant backup gateway to protect your system from downtime caused by failures.

**Gateway Network**

Active Connections	Remote Gateways	Bytes Sent	Bytes Received
1 / 1	2	597 B/sec	630 B/sec

**Connections**

<b>Designer Sessions</b> 0 open	<b>Databases</b> 1 / 1 connected
<b>Gateway Network Connections</b> 1 / 1 connections	<b>OPC Connections</b> 1 / 1 connected
<b>Store &amp; Forward</b> 0 stores quarantined	<b>Devices</b> 2 enabled
<b>Vision Clients</b> 0 open	

**Environment**

Process Id	26144
Operating System	Windows 10   amd64
Java Version	11.0.2+7-LTS
Local Time	11:55:45 AM
Available Disk Space	97gb / 238gb
Detected NICs	10.10.110.52

**Systems**

Performance	3% CPU   667mb
Redundancy	Not configured
Modules	19 installed
Tags	274 tags
Alarm Pipelines	0 / 2 active
SFCs	0 running
EAM Role	Unknown
Reports	14 scheduled

## Config

If you are not already logged into your Gateway, **Config** tab presents you with a login screen. Enter the **username** and **password** for the Ignition administrator. This was the first account created during installation. From the Config page, you can setup all connections, projects, and perform all the Gateway and platform operations. The list of options on the left menu changes based on what modules are installed. You can select any of the available options to get more detailed information. This page also provides some links to common actions to help get you started.

The Configuration section allows you to set up all connections, projects, and settings. Here are some common actions to get you started.

Category	Action
PLATFORM	Update System Name Configure Redundancy Install or Upgrade a Module Create New Project Activate a License Download Gateway Backup
NETWORKING	Change Web Server Settings Enable SSL for the Gateway Network Create an SMTP Profile Manage incoming/outgoing Gateway Network connections
SECURITY	Create a new user Assign a user a new role View the logs of an audit profile Define a Security Zone Set access levels on a Security Policy
CONNECTIONS	Create a new database connection Connect to a 3rd party OPC server Create a new device connection
SYSTEMS	Create an alarm journal profile Manage schedules and holidays Create a new alarm notification profile Test an alarm notification pipeline Add users to an on-call roster
DATA ACQUISITION	Define a new realtime tag provider Manage tag historians Quickly read or write tags in a device

## Designer Launcher

The [Designer Launcher](#) locates all the Gateways that are available on your local network. Once the Designer is open, you can access existing projects or create new projects on the Gateway. The **Designer Launcher** button on the top right side of the page and the [Download](#) button opens the Designer Launcher Download page. Here you can find all the Designer Launchers for each operating system: Windows, Mac and Linux. Ignition automatically detects your operating system so all you have to do is download the launcher and follow the steps to install the Designer Launcher. To learn about what the Designer can do, go to the [Designer](#) section of this manual.

The screenshot shows the Ignition software interface. At the top left is the Ignition logo. To its right are links for 'Help ?' and a prominent blue button with the text 'Get Designer'. A vertical sidebar on the left contains three items: 'Home' (selected), 'Status', and 'Config'. Above the main content area, a breadcrumb navigation bar shows 'Home > Get Started'. The main content area has a dark blue header with the word 'WELCOME' and the text 'Meet Ignition'. Below this is a large orange icon featuring a white exclamation mark. The text 'Build It' is centered below the icon. A callout box on the right side is titled 'Get the Designer'. It contains the text: 'The Designer brings all your data, systems, and developers together into one beautifully simple, integrated development environment specifically designed to help you build industrial applications more quickly.' To the right of the text is a small icon depicting a building and a pencil. Below the callout box is a red-bordered button labeled 'Download Designer Launcher'.

## Starting and Stopping the Gateway

After installation, the Gateway starts automatically. The Gateway runs as a service, so you can use your operating system's normal mechanisms to start or stop the service. You can also start or stop the Gateway from command line.

### Windows

Ignition's installation directory contains `start-ignition.bat` and `stop-ignition.bat`, which can start or stop the service. Example:

```
C:\Program Files\Inductive Automation\Ignition> start-ignition.bat
```

However, you can also use Windows native service commands to control the running state of the Gateway:

```
net start ignition
```

```
net stop ignition
```

### Linux

You can control the service using the `ignition.sh` script. It can be called with the `start` and `stop` parameters to perform the relevant operations.

For example:

```
/usr/local/bin/ignition/ignition.sh start
```

Additionally, you can use native terminal commands to start or stop the service:

```
service ignition start
```

```
service ignition stop
```

## Mac OS X

You can access the service from the install directory using the "ignition.sh" script. On a typical Mac install using the dmg installer, the full command (without a custom location specified) is the following:

```
/usr/local/ignition/ignition.sh start
```

## Gateway Command-line Utility

The [Gateway Command-line Utility - gwcmd](#) (GCU) is a lightweight standalone application that provides information about the Gateway. It performs high-level tasks that aren't available inside the Gateway webpage such as stopping and restarting the Gateway server, and setting ports used between the Gateway and clients. It shows the status of the Tomcat web server and the Ignition Gateway application. You can reset the Gateway password, and even launch the web browser to the Gateway webpage.

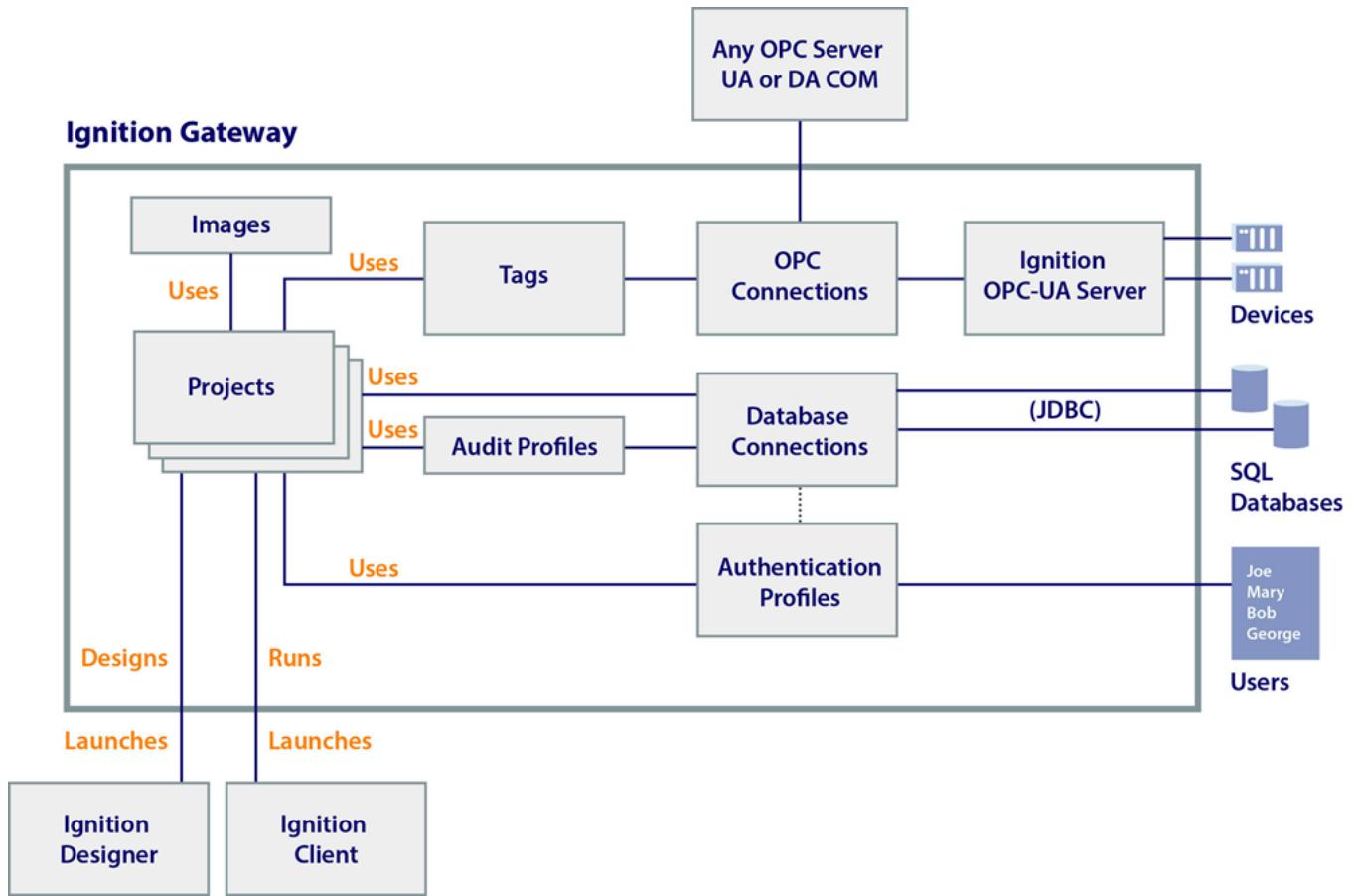
For more information, refer to the page on the [Gateway Command-line Utility - gwcmd](#).

## Gateway Architecture

The Gateway's architecture contains many parts, each one letting you perform a specific task. The Gateway parts are as follows:

- System Management
- Project and Module Management
- Security and Auditing Settings
- Database Connectivity
- Alarming and Modification Settings
- Tags Provider Settings
- OPC Connectivity
- Enterprise Administration Settings
- Projects

The following image shows the different parts of the Gateway and how projects work within the Gateway. Note the parts that are outside the Ignition Gateway box, non-Ignition OPC servers, databases, devices, etc., are all separate from Ignition but can be connected.



In This Section ...

# Home

The Home tab provides you with all of the tools you need to get started designing projects and launching Perspective Sessions and Vision Clients. There are four launchers on the Homepage that will quickly get you started:

- The [Designer Launcher](#) allows you to create or modify a project. Download the launcher and create a shortcut so it's always on your desktop when you need it.
- The [Vision Client Launcher](#) browses all Gateways for Vision projects that are available on your local network. Once your projects are added to the Vision Client Launcher, they will be displayed and available to open in a Vision Client. Simply download the launcher and create a shortcut on your desktop so it's always at your fingertips when you want to launch a Vision Client.
- The [Perspective Session Launcher](#) allows you to easily launch a session directly in your browser. Simply click the link and Ignition will display all your Perspective projects.

This feature is new in Ignition version **8.1.0**  
[Click here](#) to check out the other new features

- The [Perspective Workstation](#) is a single application that acts as both a launcher, and desktop "wrapper" for Perspective Sessions.

While the top navigation bar is present no matter what tab you are in, the Get Designer button in the upper right corner does not require that a user login to the Gateway. This allows a user to launch the Designer right away, only logging in once the Designer has fully launched. See the [Designer](#) section for more information on launching and using the Designer.

On the Homepage, we also provide quick links to several resources: [Inductive University](#), Product Documentation, and the Appendix which contains a complete reference for [components](#), [expressions](#), and [scripting functions](#) in Ignition.

## On this page ...



## Customizing the Gateway Homepage

[Watch the Video](#)

[Home > Get Started](#)

## WELCOME

## Meet Ignition



## Build It

**Get the Designer**

The Designer brings all your data, systems, and developers together into one beautifully simple, integrated development environment specifically designed to help you build industrial applications more quickly.

[Download Designer Launcher](#)

## Run It

**Vision Client Launcher**

Download the Native Client Launcher to open Vision clients from any Ignition Gateway.

[Download Vision Client Launcher](#)**Perspective Workstation**

Download Perspective Workstation to open sessions from any Ignition Gateway.

[Download Perspective Workstation](#)**Perspective Session Launcher**

Launch a Perspective session directly in your browser or download the native application.

[View Projects](#)

## Related Topics ...

- [Status](#)
- [Config](#)
- [Inductive University](#)



# Status

## Your Gateway at a Glance

The Status tab provides both an 'at a glance' overview of all of the systems in your Gateway, while also giving you the ability to drill down into specific systems and get a more in depth view of what is currently happening in your system. The Systems and Connections sections that are displayed on the left side of the Status page are based on what modules are currently installed. Some 3rd party modules could potentially add sections that are not discussed in this manual.

When first opening the Status tab, you will be taken to the Overview page. This page provides an overview of all Ignition systems, while also acting as a launchpad to all other sections in the Status tab. The pages in the Status tab are built around the idea of quickly drawing attention to problem areas by highlighting them. As you can see, this Gateway has a faulted database. The pages in the Status tab also allow you to 'drill down' into sections to see more information. Most objects can be clicked on, like the faulted database. Clicking either of these will take you to the appropriate section, allowing you to quickly find out what is wrong with a particular system.

## On this page ...

- [Your Gateway at a Glance](#)
  - [Systems](#)
  - [Connections](#)
  - [Diagnostics](#)
- [Search](#)



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## Gateway Status Page Troubleshooting

[Watch the Video](#)

The screenshot shows the Ignition Gateway Overview page. The left sidebar has sections for Home, Status, Config, SYSTEMS (Overview, Performance, Alarm Pipelines, Gateway Scripts, Modules, Redundancy, Reports, SFCs, Tags, Transaction Groups), CONNECTIONS (Databases, Designers, Devices, Gateway Network, Store & Forward, OPC Connections, Perspective Sessions, Vision Clients), and DIAGNOSTICS (Execution, Logs, Running Scripts, Threads). A search bar is at the bottom.

**Architecture**

<b>Gateway   Controller</b> Version: 8.0.0-beta0 (b2019031407) License: licensed Uptime: a day	No Redundancy Add a redundant backup gateway to protect your system from downtime caused by failures.
---	--

**Environment**

Process Id	26144
Operating System	Windows 10   amd64
Java Version	11.0.2+7-LTS
Local Time	3:30:44 PM
Available Disk Space	97gb / 238gb
Detected NICs	10.10.110.52

**Systems**

Performance	5% CPU   769mb
Redundancy	Not configured
Modules	19 installed
Tags	281 tags
Alarm Pipelines	0 / 2 active
SFCs	0 running
EAM Role	Unknown
Reports	14 scheduled

**Connections**

<b>Designer Sessions</b> 1 open	<b>Databases</b> 1 / 2 connected ⚠️ 1 databases faulted
<b>Gateway Network Connections</b> 1 / 1 connections	<b>OPC Connections</b> 1 / 1 connected
<b>Store &amp; Forward</b> 1 stores quarantined	<b>Devices</b> 2 enabled
<b>Vision Clients</b> 0 open	<b>Perspective Sessions</b> 1 open

The Status section of the Gateway Webpage provides detailed information relating to the following parts:

Systems	
Overview	Provides a top-down view of many of the components of your Gateway. This view is also useful for determining what step might be next when setting up your Ignition Gateway for the first time. You can view the status of your database connections, device connections, OPC connections, the number of open Clients and the number of open Designers.  The <b>Status &gt; Overview</b> page displays the number of Perspective Sessions currently running.
Performance	Displays the performance status for the Ignition system such as CPU, Memory and Threads.
Alarm Pipelines	Shows the status details about the <a href="#">alarm notification pipelines</a> . You can see the status of an alarm and where the alarm is in the pipeline.
Gateway Scripts	Shows status details about all the <a href="#">Gateway event scripts</a> running in Gateway. You can see information such as their execution status, whether the scripts are running or not, and so on.
Modules	A list of <a href="#">installed modules</a> , their status, as well information about their version and current license state.
Redundancy	Lists information about the current state of <a href="#">Redundancy</a> in Ignition. This information is only helpful when connected to another redundant Ignition server.
Reports	Displays information about the current and scheduled reports on the Gateway if you are using the <a href="#">Reporting module</a> .
SFCs	Displays information about <a href="#">Sequential Function Chart</a> (SFC) instances.
Tags	Lists information and statistics about all configured Tag Providers as well as a view into the Tag subscription model, scan classes, and what tags it is currently subscribed to.
Transaction Groups	Displays information about the current <a href="#">Transaction Groups</a> .

## Connections

Databases	Displays a list of configured databases, and if they have a valid connection or not. Shows active queries, long running queries, the number of queries a second that are running, as well as a trend showing the percentage of queries that completed in that time.
Designers	Displays information on currently running Designer sessions along with some information about each session.
Devices	Displays a list of currently configured OPC UA devices and which are connected and which have a faulty connection. It also shows how many Tags Ignition is requesting from the device along with how often it is requesting them. This information is used to determine if the device is overloaded with too many requests too quickly, or if the device is being under utilized.
Gateway Network	Shows an overview of the status of all Gateways within the Gateway Network. It also provides some metrics for each Gateway, giving an idea of the rate of data transfer between two Gateways, as well as a list of connection events.
Store & Forward	Displays a list of <a href="#">Store and Forward</a> engines, including status, as well as the number of records currently in each Store and Forward system.
OPC Connections	Displays a list of all current <a href="#">OPC connections</a> and their status.
Perspective Sessions	Shows a list of current Perspective sessions and details about each session.
Vision Clients	Shows a list of current Vision Clients and details about each client.

## Diagnostics

Execution	Displays a status of all tasks that your Gateway runs on a schedule, such as duration and execution time of an alarm journal update or the average time it takes a Gateway to execute a Tag Group.
Logs	Displays errors caused by Gateway events like database or device connections, authentication profiles, alarm journals, and pipelines. Logs include a wealth of information about the running state of the Gateway.
Running Scripts	Shows all actively running Gateway scripts, as well as providing a way to terminate any running script. In addition, Vision client and Designer consoles have a Running Scripts tab, which also lists running scripts and provides a way to terminate them.
Threads	Shows what each thread is doing in the Gateway, including their state and CPU usages.

## Search

The Status tab also displays a search bar at the bottom left of each page. This search bar allows you to type in a word or phrase, and it will list all appropriate pages in both the Status and Config tabs to easily find all pages related to a specific system.

Controller admin | Sign Out Help ? Get Designer

Ignition!

Home Status Config

SYSTEMS

- Overview
- Performance
- Alarm Pipelines
- Gateway Scripts
- Modules
- Redundancy
- Reports
- SSO

Search results for 'database'...

Databases in > Connections

Store & Forward in > Connections

Transaction Groups in > Systems

Connections in > Databases

Drivers in > Databases

Store and Forward in > Databases

database

Valid Connections 1 / 2

Total Throughput 2.9 queries/sec

Configuration

filter View 20 ▾

Driver	Status	Connections	Throughput	Actions
MySQL ConnectorJ	✓ Valid	0 / 8	2.9 queries/sec	<a href="#">Details</a>
Oracle JDBC Driver	⚠ ERROR	0 / 8	0.0 queries/sec	<a href="#">Details</a>

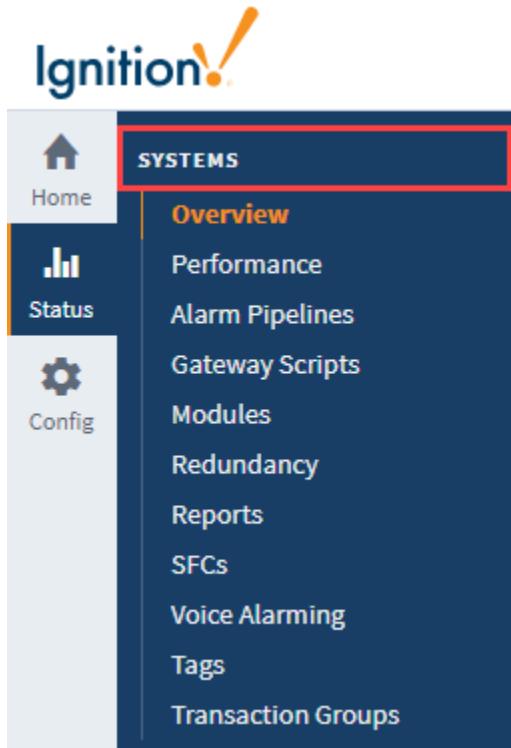
Related Topics ...

- [Config](#)
- [Home](#)

In This Section ...

# Systems

The Systems section of the Status tab displays information regarding the internal Gateway systems. This includes systems such as the currently running Transaction Groups as well as active Alarm Pipelines. These sections are not necessarily concerned with any connections to external systems.



## On this page ...

- Overview Section
  - Architecture
  - Environment
  - Systems
  - Connections
- Performance
- Alarm Pipelines
- Gateway Scripts
- Modules
- Redundancy
  - Force Re-Sync
  - Request Failover
- Reports
- SFCs
- Voice Alarming
- Tags
- EAM Tasks
- Transaction Groups



## Gateway Status Page Troubleshooting

[Watch the Video](#)

## Overview Section

The Overview page is the first page that you see when navigating to the Status tab. It provides a visual synopsis of everything in the Gateway, as well as some basic information about the server Ignition is installed on. There are four sections on the page: **Architecture**, **Environment**, **Systems**, and **Connections**.

**Ignition!**

Status > Systems > Overview

### Architecture

**Gateway | Ignition-ignition8-ubuntu-64bit**  
Version: 8.0.0-beta0 (b2019032009)  
License: Licensed  
Uptime: a day

No Redundancy

Add a redundant backup gateway to protect your system from downtime caused by failures.

Active Connections	Remote Gateways	Bytes Sent	Bytes Received
1 / 2	1	2 KB/sec	1 KB/sec

### Connections

Designer Sessions  
2 open

Databases  
1 / 1 connected

Gateway Network Connections  
2 / 2 connections

OPC Connections  
1 / 1 connected

Store & Forward  
0 stores quarantined

Devices  
5 enabled

Vision Clients  
0 open

### Environment

Process Id	37117
Operating System	Linux   amd64
Java Version	11.0.2+7-LTS
Local Time	10:04:17 AM
Available Disk Space	3gb / 16gb
Detected NICs	10.10.115.3

### Systems

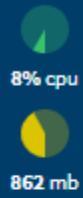
Performance	9% CPU   512mb
Redundancy	Not configured
Modules	18 installed
Tags	1,103 tags
Alarm Pipelines	0 / 1 active
SFCs	0 running
EAM Role	Unknown
Reports	4 scheduled

## Architecture

The Architecture segment provides a top down view of your Gateway. You can see your Ignition version and resource usage, as well as similar information with a redundant Gateway, if one is connected. You also get an overview of the Gateway Network including how many active connections there are, and what is the amount of data being transferred between them.

## Architecture

Gateway | Ignition-  
ignition8-ubuntu-64bit



Version: 8.0.0-beta0  
(b2019032009)

License: licensed  
Uptime: a day

### No Redundancy

Add a redundant backup gateway to protect your system from downtime caused by failures.

## Gateway Network

Active Connections

2 / 2

Remote Gateways

2

Bytes Sent

2 KB/sec

Bytes Received

1 KB/sec

## Environment

The Environment segment provides some basic information about your server such as the Operating System (OS), Java version, available disk space, and IP address of detected network interface cards (NIC)..

## Environment

Process Id	37117
Operating System	Linux   amd64
Java Version	11.0.2+7-LTS
Local Time	11:18:31 AM
Available Disk Space	3gb / 16gb
Detected NICs	10.10.115.3

## Systems

The Systems segment summarizes each of Ignition's systems. Here, you can see how many modules you have installed as well as how many Tags are configured in your Gateway, along with a handful of other information. Click on any of the links in blue to find out more information about a

particular system.

Systems	
Performance	6% CPU   504mb
Redundancy	Not configured
Modules	18 installed
Tags	1,103 tags
Alarm Pipelines	0 / 1 active
SFCs	0 running
EAM Role	Unknown
Reports	4 scheduled

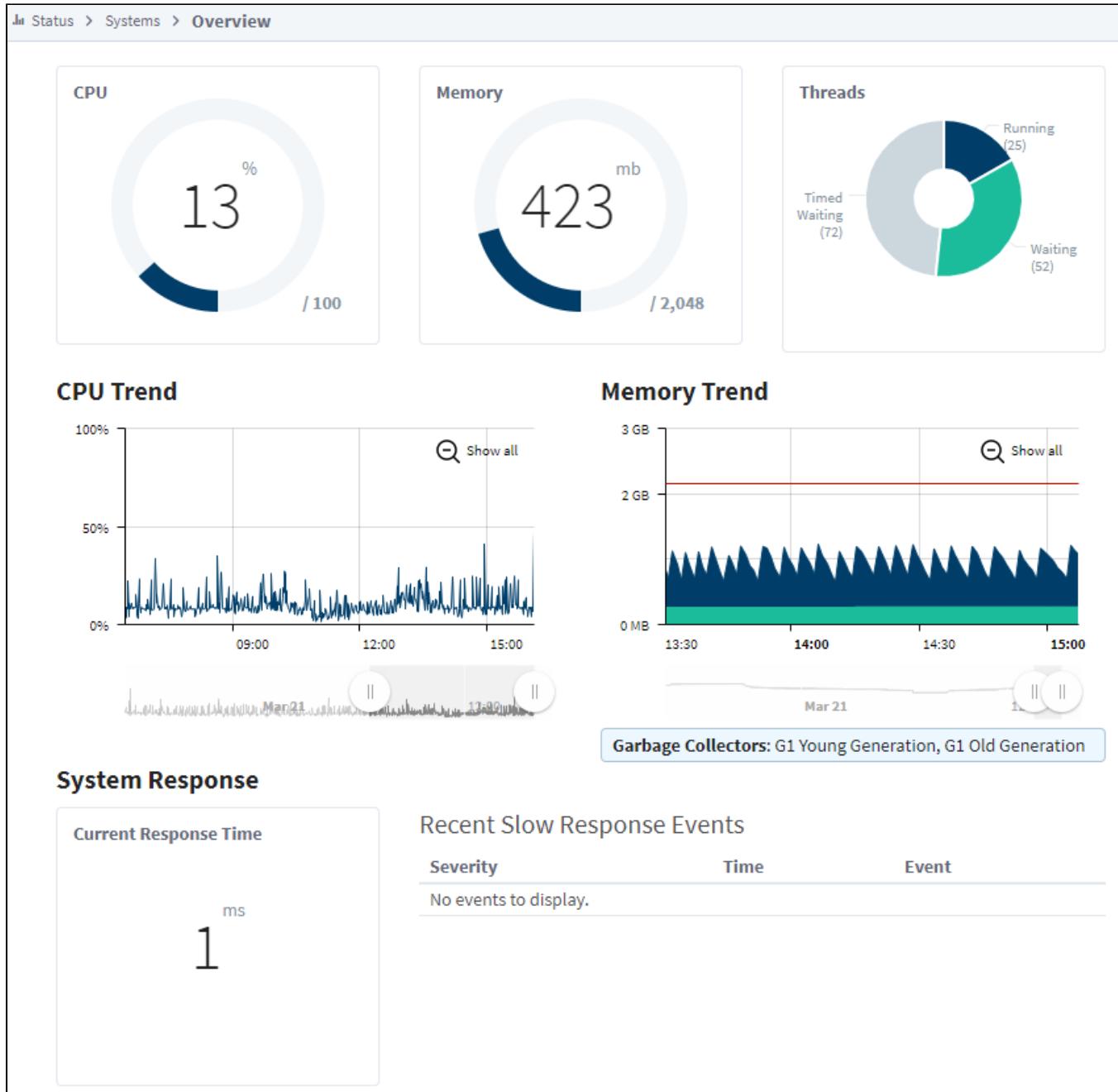
## Connections

The Connections segment shows all of the systems that Ignition is connected to. If any of these have issues, they will be outlined in red. Clicked on the connection to be taken to the relevant page within the Status tab.

Connections	
 Designer Sessions	3 open
 Databases	1 / 1 connected
 Gateway Network Connections	2 / 2 connections
 OPC Connections	1 / 1 connected
 Store & Forward	0 stores quarantined
 Devices	5 enabled
 Vision Clients	0 open

## Performance

The Performance page displays information on the resource usage of the Gateway. This page enables you to quickly assess your Gateway's overall health and determine if the Gateway is being taxed too heavily for the server it's running on. You can see the current CPU usage, the current memory usage (in megabytes) out of the total allocated for the Gateway, and how CPU threads are performing. In the CPU Trend and Memory Trend sections there are sliders you can move to set the time range anywhere within in the previous 24 hours. The lower portion of the page shows the current system response time as well as a log of any recent slow response events.



## Alarm Pipelines

The Alarm Pipelines page lists the currently configured alarm pipelines in the Gateway. Each pipeline displays the number of alarm items currently running through it. Click on the Details button to the right to open up a new page that will show the alarm pipeline status and logs. There will also be a set of tabs at the top of the page. One for the Pipeline Status that is already open, the other for Pipeline Logs. This [log viewer](#) will act as a miniature log viewer that will only show logs that pertain to this particular pipeline.

The screenshot shows the 'Alarm Pipelines' page. At the top, there is a breadcrumb navigation: Status > Systems > **Alarm Pipelines**. A red box highlights the 'Alarm Pipelines' button. In the top right corner, there is a 'Configuration' button. Below the breadcrumb, the word 'Active' is displayed above a large '0/2'. On the right side, there is a pagination control showing '1 of 1' with previous and next buttons. Below this, there is a search/filter bar with 'Filter type to filter' and a 'View 20' dropdown. The main table has columns: Name, Active?, Items, and Actions. It lists two entries: 'project:alarm-pipelines:/pipeline:Loop Pipeline' (Active? false, Items 0) and 'project:NewProject\_SJP:/pipeline:Test Pipeline' (Active? false, Items 0). Each entry has a 'Details' button in the Actions column.

Name	Active?	Items	Actions
project:alarm-pipelines:/pipeline:Loop Pipeline	false	0	<a href="#">Details</a>
project:NewProject_SJP:/pipeline:Test Pipeline	false	0	<a href="#">Details</a>

## Gateway Scripts

The Gateway Scripts page displays a list of all currently configured Gateway scripts. These are scripts that are configured in the [Gateway Event Scripts](#) section of the project. The tabs at the top of the page will swap between the different types of Gateway Event Scripts: Timer, Tag Change, Message Handler, Startup, and Shutdown. They provide useful information such as the name of the project that it is running in as well as the last time it ran, the duration and status (if it was successful or not).

With this page you can quickly verify that your scripts are running properly. If a script has an error, click on the error for more details about what went wrong with the script. All of the logs for that section are also contained in the log viewer at the bottom of the page, to make it easy to see a list of all of the logged errors for that set of Gateway Event Scripts.

Status > Systems > **Gateway Scripts**

Timer Tag Change Message Handler Startup Shutdown

« ‹ 1 of 1 › »

**Filter** type to filter View 20 ▾

Project ▾	Name	Rate	Last Execution	Duration	Status
No scripts found.					

« ‹ 1 of 1 › »

**Log Activity**

Min level INFO ▾ i Live Values  on Merge to Logs ↗

Logger	Time	Message
No log entries found		

## Modules

The Modules page shows a list of the currently installed modules, their current version, and if they are running properly with a license. The top of the page shows a quick count of the running and licensed modules, so you can easily tell if anything is not working. It is then easy to scroll down through the list to see which modules are having issues.

The screenshot shows the 'Modules' section of a software interface. At the top, there's a navigation bar with 'Status > Systems > Modules'. A red box highlights the 'Modules' tab. To the right, there's a 'Licensing Configuration' button. Below the navigation, there are three main sections: 'Running Modules' (18 / 18), 'Licensed Modules' (18 / 18), and 'License Details' (showing License Key LRN-IGN, Version 8, and edition standard). The 'Inductive Automation, LLC' section lists various drivers with their names, versions, licenses, and status (all are green 'RUNNING').

Name	Version	License	Status
Alarm Notification	5.0.0-beta0 (b2019032010)	Activated <a href="#">🔍</a>	<span style="color: green;">✓ RUNNING</span>
Allen-Bradley Driver	5.0.0-beta0 (b2019032010)	Activated <a href="#">🔍</a>	<span style="color: green;">✓ RUNNING</span>
DNP3 Driver	3.0.0-beta0 (b2019032010)	Activated <a href="#">🔍</a>	<span style="color: green;">✓ RUNNING</span>
Enterprise Administration	3.0.0-beta0 (b2019032010)	Activated <a href="#">🔍</a>	<span style="color: green;">✓ RUNNING</span>
Logix Driver	4.0.0-beta0 (b2019032010)	Activated <a href="#">🔍</a>	<span style="color: green;">✓ RUNNING</span>
Modbus Driver	6.0.0-beta0 (b2019032010)	Activated <a href="#">🔍</a>	<span style="color: green;">✓ RUNNING</span>

## Redundancy

The Redundancy section displays information regarding the redundant system, if one is configured. It easily shows the Role of the Gateway you are viewing, the status of the connected Gateway, and their IP addresses. The trends on this page give a snapshot of the last few minutes of communication between the two Gateways. The first trend shows the data that is being sent and received between the two Gateways, the second shows the state updates that have recently occurred. The bottom of the page contains a log of the last system events, to easily track major events between the Gateways.

## Force Re-Sync

The **Force Re-Sync** button forces a full synchronization of the redundant configuration state. The backup node will be forced to restart.

## Request Failover

The **Request Failover** button switches the active node in a redundant pair.

Severity	Time	Event
<span style="color: #0070C0;">i</span>	22Mar2019 16:43:04	Initiating a forced configuration re-sync
<span style="color: #0070C0;">i</span>	22Mar2019 16:43:04	Forced configuration sync initiated.
<span style="color: #0070C0;">i</span>	22Mar2019 16:42:28	Redundancy state changed: Role=Backup, Activity level=Cold, Project state=OutOfDate, History level=Full

## Reports

The Reports page shows information on any Reports that have at least one scheduled action set up. The top of the page gives a quick count of reports that are executing an action, have executed an action, or are going to execute an action. Below you can also find a list of Reports in those states as well, to quickly see what project they are located in, or what their last execution time was. As with most other pages, there is also a log of all events related to reports at the bottom of the page.

..> Status > Systems >

### Report Stats

Currently Executing

0

Completed Scheduled Executions

1

Upcoming Scheduled Executions

1

### Currently Executing Reports

Project	Report Path	Status	Execution Start	Elapsed Time
No items to display				

### Completed Scheduled Executions

Project	Report Path	Status	Execution Start	Elapsed Time
TestProject	Report	Finished	30Sep2016 00:00:00	283 milliseconds

### Upcoming Scheduled Executions

Project	Report Path	Scheduled Start	Actions
TestProject	Report	01Oct2016 00:00:00	Save File

### Log Activity

Min levelINFOLive Values  ON

LoggerTimeMessage

No log entries found

## SFCs

The [Sequential Function Charts](#) (SFCs) section displays a list of all of the currently configured SFCs along with a count of the currently running charts at the top of the page. Click the **Details** button next to any SFC for details about that particular Chart.

» Status > Systems > Sequential Function Charts

### Chart Stats

Running Charts  
0 / 1

### Defined Charts

Chart ▲	Project	Run Mode	Running Instances	Actions
New Chart	test	✓ Callable	0	<a href="#">Details</a>

On the Details for an individual SFC, there are two tabs: Chart Instances and Chart Logs. It contains a list of all currently running Chart instances, and allows you to swap tabs to look at any logged events for that particular chart.

» Status > Systems > Sequential Function Charts

- [Chart Instances](#)
- [Chart Logs](#)

### Chart Instances

Status	Execution Start ▲	Current Step	Parent	Started By	Actions
No items to display.					

## Voice Alarming

The Voice Alarming page provides details about the currently configured [Voice Notification Profiles](#) on the Gateway. This status can be used to quickly see which Notification Profiles are not working. Clicking the details button enables you to see the current calls with that Voice Notification profile and the current queue of calls waiting to be completed.

Status > Systems > **Voice Alarming**

[Configuration](#)

## Voice Alarming

### Available Voices

Name	Locale
No voice modules installed.	

### Profiles

Name	Status	Pending Calls	Action
Skype	⚠️ unknown [-1]	0	<a href="#">Details</a>
voiceProfile1	✓ Registered with VOIP Host	0	<a href="#">Details</a>

## Tags

The Tags page contains a lot of information about the Gateway's configured Tags and Tag Providers. The first page will show a list of all realtime and historical Tag Providers that make it easy to see if any of them are having issues. Clicking on an errored provider will show an error message that may help fix the problem. Clicking on the **Details** button to the left will open up a page with more information about the Tags in that particular provider.

Status > Systems > **Tags**

[Realtime Configuration](#) [Historical Configuration](#)

#### Realtime Providers

Name	State	Tag Count	Actions
default	● Running	299	<a href="#">Browse</a>
ExportTags	● Running	11	<a href="#">Browse</a>
System	● Running	104	<a href="#">Browse</a>
ubuntu-64bit_default-tags	● Unknown	Not Available	<a href="#">Browse</a>

#### Historical Providers

Name	State	Actions
MySQL	✓ Good	<a href="#">Details</a>
vm_db	✓ Good	<a href="#">Details</a>



**INDUCTIVE  
UNIVERSITY**

### Tag Diagnostics

[Watch the Video](#)

The details of the Tag Provider will show a list of all currently configured Tags in that Tag Provider, and show some basic information about them. You can browse through the Tag structure to get more information about each Tag. When clicking the Details button for an individual Tag, you will be brought to a Tag Diagnostics screen that will provide more detailed information about that particular Tag, such as if

it has a script written in its Tag event scripts and what its last value was, among other information.

The screenshot shows the 'Tags' tab for the system 'AU 1'. There are two items listed: 'Fan1 HOA' and 'Fan2 HOA'. Both are of type 'AtomicTag' and have a quality of 'Good'. The 'Actions' column contains a 'Details' button for each entry.

Name	Type	Quality	Actions
Fan1 HOA	AtomicTag	Good	<a href="#">Details</a>
Fan2 HOA	AtomicTag	Good	<a href="#">Details</a>

The screenshot shows the 'Tag Diagnostics' page for the 'Fan 1 HOA' tag. It displays various properties of the tag:

Path	Value
Last Value	n/a
Last Quality	Good
Last Execution	n/a
Value Timestamp	09Jul2019 15:41:26
Last Error	n/a
Last Error Cause	n/a
Alarmed?	false
Bound?	false
Historical?	false
Secure?	false
Scaled?	false
Scripted?	false

The Groups Tab allows you to see the Tag Groups configured. It also shows the number of executions for each Tag Group, the last time the Group was executed and the average duration in milliseconds. Provider Logs display any events that relate to that particular provider.

The screenshot shows the 'Groups' tab for the 'default' group. It lists various tag groups with their execution counts and average durations:

Name	Mode	Rate	Leased Rate	Is Leased	Executions	Last Duration	Avg Duration
Direct	Direct	1000	1000	false	73787	0	0
Direct 5 Seconds	Direct	5000	1000	false	14769	0	0
Driven	Driven	10000	1000	false	81172	0	0
Driven Machine State	Driven	10000	1000	false	81172	0	0
Driven Manual	Driven	4000	500	false	165852	0	0
Driven One Shot	Driven	120000	1000	true	1	0	0
Leased	Leased	10000	1000	false	81172	0	0
Time Driven	Driven	60000	1000	false	75018	0	0
default	Direct	1000	1000	false	73787	0	0

## EAM Tasks

The EAM Tasks section will only show up once the [EAM module](#) is configured. This page shows information regarding the currently running and scheduled tasks, as well as tasks that were recently executed and whether they were successful or not. From here you can pause a scheduled task, or see the error that caused a previous execution to fail.

The screenshot shows the 'EAM Tasks' page within a software interface. At the top left, there's a navigation bar with 'Status > Systems > EAM Tasks'. A red box highlights the 'EAM Tasks' button. In the top right corner, there's a 'Configuration' button. Below the navigation, there are two large boxes: 'Executing Agent Tasks' on the left and 'Scheduled Agent Tasks' on the right, both containing the number '0'. Under each box is a table header and a message indicating 'No items to display.'

Task Name	Task Type	Task State	Execution Start	Progress	Message
No items to display.					

Task Name	Task Type	Repeats	Next Execution Start	Status
No items to display				

Task Name	Task Type	Task Start	Agent	Task Result
Collect Backup (forced)	backup	25Mar2019 12:39:32	Ignition-2	<span style="color: green;">✓ Success</span>

## Transaction Groups

The Transaction Groups page makes it easy to get a quick count of the currently running [Transaction Groups](#) as well as the currently errored groups. Below the counts is a list of Projects that contain Transaction Groups and some basic information like how many are running and how many database queries it generating. Clicking the details button to the right for one of the Projects brings up more information about that Project's Groups. There are some counts on the number of Groups in various states, as well as a list of the groups. Any Groups that have problems can be clicked on to see what the error is to get a better idea of why the Group is unable to run.

## Gateway Stats

Running Groups

0 / 5

Errored Groups

0 / 5

« < 1 of 1 > »

Filter type to filter

View 20 ▾

Project ▾	Total	Running	Errored	Tag Writes	DB Queries	Actions
Tank_Control	1	0	0	0 / sec	0 / sec	<button>Details</button>
NewProject_SJP	4	0	0	0 / sec	0 / sec	<button>Details</button>

« < 1 of 1 > »

Related Topics ...

- [Connections](#)
- [Diagnostics - Logs](#)

# Connections

## Status of Gateway Connections

The Connections section of the Status tab on the Gateway Webpage contains information regarding the status of Gateway connections to external systems. The list of systems displayed under the Connections section is based on what modules are installed. It can include EAM Agents, Databases, Devices, Store and Forward, the Gateway Network including other Gateways within the Gateway Network, and many more. The Connections section allows you to drill down and open up more specific information to easily find problems with anything connected to the Gateway, and even find crucial information about a faulty connection.

On the left side of the Status section of the Gateway Webpage, you'll see a list of all your connections. Click on any system to open a detailed page to see all the available options, and to get more detailed information. Some third party modules could potentially add sections that are not discussed in this manual.

A screenshot of a sidebar menu titled "CONNECTIONS". The menu items listed are: Databases, Designers, Devices, Gateway Network, Store & Forward, OPC Connections, Perspective Sessions, and Vision Clients. The "Gateway Network" item is highlighted in white, indicating it is the active section.

## On this page ...

- [Status of Gateway Connections](#)
- [Log Activity](#)

## Log Activity

Most of the systems in the Connection section have a Log Activity area somewhere within the details of the connection. This Log Activity area functions much like the [Logs in the Diagnostics](#) section of the Status page in that you see a list of all log messages depending on the logging level you are looking at as well as the filters you have setup. However, what makes the Log Activity areas in each Connections page unique is that they are filtered to only show loggers for that particular system. This helps you narrow down any potential problems by showing you only the information that pertains to the section you are looking at.

A screenshot of a "Log Activity" panel. At the top, there is a "Min level" dropdown set to "INFO" with a help icon (info symbol) next to it. To the right of the dropdown are buttons for "Live Values" (with a "ON" switch) and "Merge to Logs" (with a circular arrow icon). Below this is a table header with columns: "Logger", "Time", and "Message". A message below the table states "No log entries found". Above the table are navigation icons: back, forward, and search.

### Related Topics ...

- [Diagnostics - Logs](#)

### In This Section ...

# Connections - EAM Agents

## EAM Agents

The EAM Agents page shows a list of all the currently configured Agents, including information on the connection status. Agents can be organized into groups allowing you to group agents by location or agent function. If no groups exist, all Agents will be in the Default Group.



## On this page ...

- [EAM Agents](#)
  - [EAM Agents Page](#)

## EAM Agents Page

The EAM Agents page contains some useful information about all of your Agent connections.

Attribute	Description
<b>EAM Agent Connections</b>	
EAM Agents	Number of connected agents out of the number of configured agents.
<b>Default Group and all groups</b>	
Gateway	Name of the Agent.
Edition	Identifies a Standard vs Edge Gateway. Edge edition shows "edge," and if it's a Standard Gateway, this field is left blank.
Status	Current status of the Agent connection.
Last Comm	Date and time recorded for the last communication with the Agent.
Last Event	Name of the event last recorded with the Agent.
Event Date	Date and time recorded for the last occurring event with the Agent.
Log Activity	Shows any EAM Agent activity along with the Time the log was created and a brief message. You can find more of these same type of messages in the Gateway Logger which is found in the <b>Status</b> section under <b>Diagnostics &gt; Logs</b> , and the Wrapper Logger file under <b>Program Files &gt; Inductive Automation&gt; Ignition &gt; logs &gt; wrapper.log</b> .

Status > Connections > EAM Agents

Configuration

### Connected Agents

1 / 1

### Default Group

Gateway ▾	Edition	Status	Last Comm	Last Event	Event Date
Ignition-2		✓ Connected	25Mar2019 14:26:30	cpu [NORMAL]	25Mar2019 12:39:20

### Log Activity

Min level: INFO

Live Values  Merge to Logs

Logger	Time	Message
E AgentLicenseDetailPage	25Mar2019 12:41:53	license.ipl cannot be loaded from the archive!
I AgentEventRecorder	25Mar2019 12:37:43	EAM event record table successfully verified.
I Agent	25Mar2019 12:37:43	[Ignition-2] Agent state has transitioned to Running
I AgentModel	25Mar2019 12:36:59	New agent 'Ignition-2' has connected to this controller. It needs to be approved. <input type="button" value="Merge"/>

#### Related Topics ...

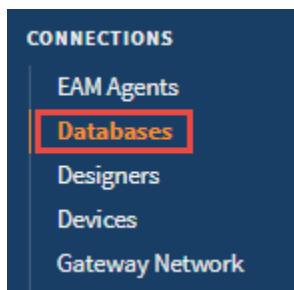
- [Enterprise Administration](#)
- [Creating a Controller](#)
- [Adding an Agent](#)

# Connections - Databases

The Databases page shows a list of configured databases, and if they have a valid connection or not. Clicking on the **Details** button to the right of a connection will either show the full error if the connection is faulted, or it will bring you to a Details page for that database connection. On the Details page, you can easily see any active queries, long running queries, the number of queries a second that are running, as well as a trend showing the percentage of queries that completed in that time.

## On this page ...

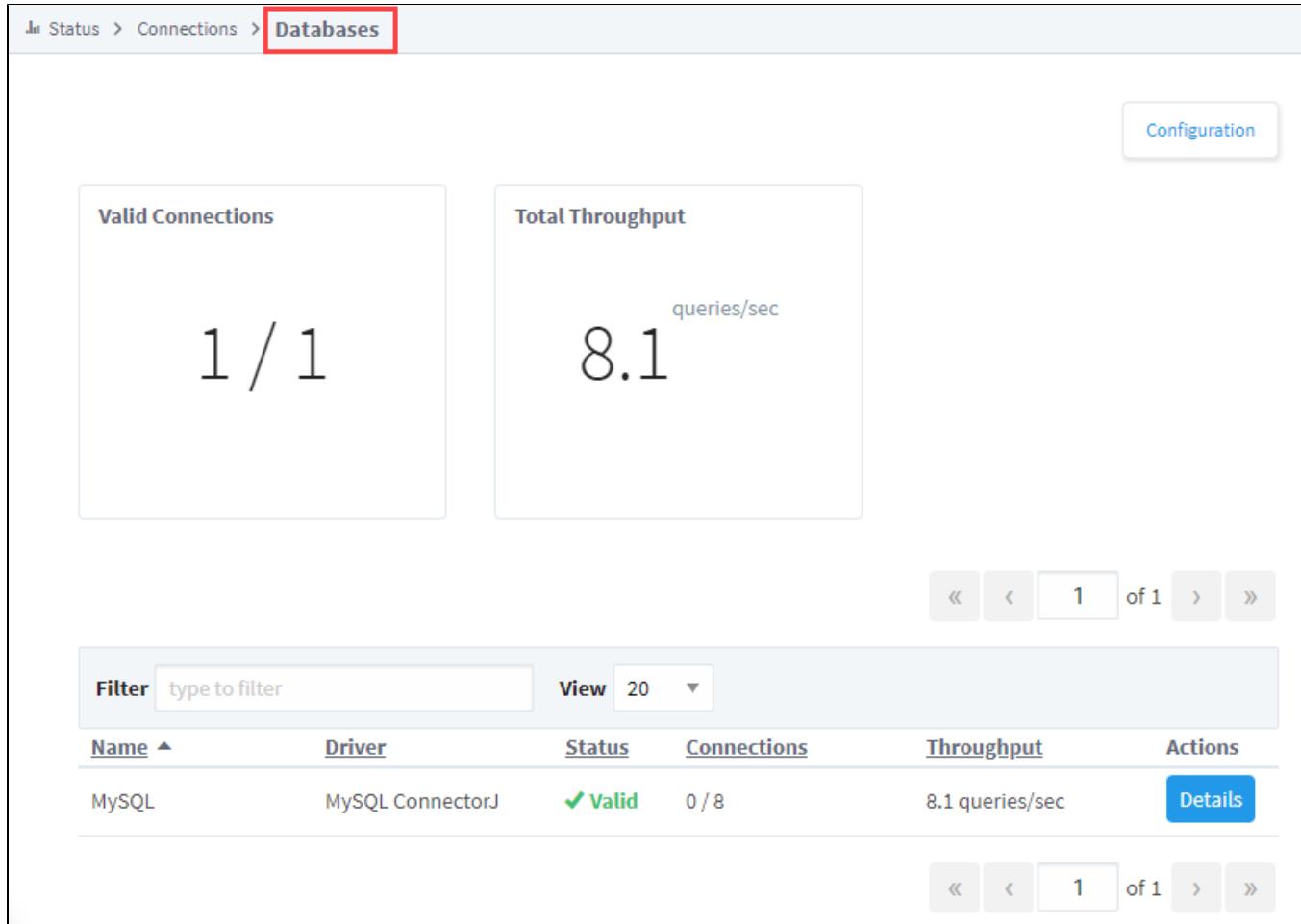
- [Databases Page](#)
- [Database Connection Details](#)



## Databases Page

The main database page contains some useful information about all of your database connections.

Attributes	Description
Valid Connections	Number of valid connections.
Total Throughput	Number of queries and their status.
Name	Name of the query.
Driver	Name of the driver.
Status	Current status of the database connection.



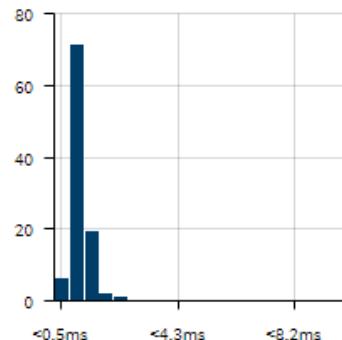
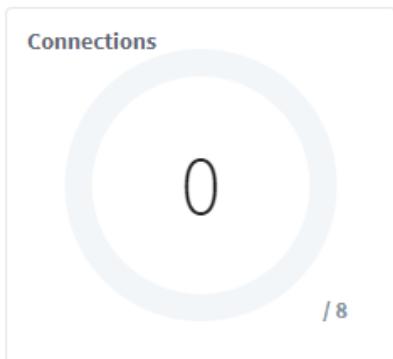
## Database Connection Details

The **Details** page for an individual connection provides more in depth information for that particular database connection.

Attribute	Description
<b>Database Stats - Stats about the database connection</b>	
Connections	Number of database connections out of configured databases.
Queries / Sec	Number of queries running per second along with a trend showing the percentage of queries that completed in that time.
<b>Active Queries - A list of currently active queries</b>	
Query	Currently running queries.
Started	When the query was started.
Actions	The ability to cancel a query.
<b>Longest Recent Queries - A list of the longest running queries.</b>	
Query	Displays the actual query.
Duration	Amount of time the query ran.
Started	When the query started running.

[Configuration](#)

## Database Stats



## Active Queries

<a href="#">Query</a> ▲	<a href="#">Started</a>	<a href="#">Actions</a>
No items to display.		

## Longest Recent Queries

<a href="#">Query</a> ▼	<a href="#">Duration</a>	<a href="#">Started</a>
SELECT a.`id`,a.`tagpath`,a.`datatype`,a.`scid`,a.`querymode`,a.`created`, b.`drvid` FROM sqlth_te a left join sqlth_scinfo b on a.`scid`=b.`id` WHERE b.`drvid` in (?, ?, ?) and a.`retired` is null or a.`retired`=0	30 ms	7 minutes ago
SELECT `id` FROM sqlth_scinfo WHERE `scname`=? AND `drvid`=?	8 ms	7 minutes ago

[Related Topics ...](#)

- [Database Connections](#)

# Connections - Designers

## Designers

The Designers page displays information on currently running designer sessions. All the open designers are displayed on the page along with some basic information about each session, such as what user is logged into each designer session and the project they are currently working on. Clicking on the **Details** button to the right of a designer session will display more information about that particular designer. On the Details page, you can see session information, as well as what designer locks the session currently has set. Locks are when a designer is working on a particular page or set of pages, the system places a lock on those resources (i.e., window, pipelines, etc.) to prevent other designers from working on the same resource. There is also a log at the bottom of the page displaying any errors pertaining to that designer session.



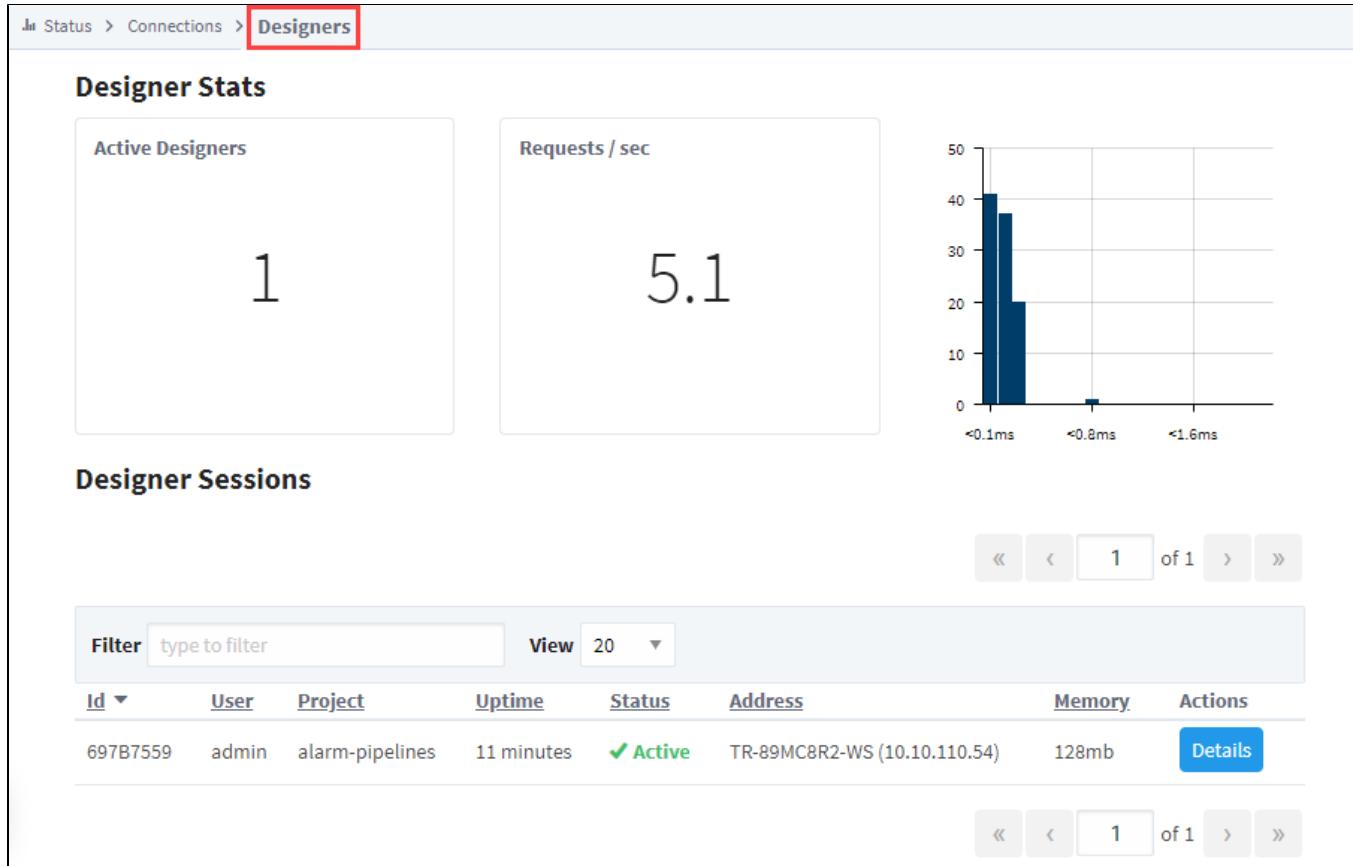
## On this page ...

- Designers
  - Designers Page
  - Designer Details

## Designers Page

The main Designers page has a list of all currently running designer sessions, and some basic information about all of them.

Attribute	Description
<b>Designer Stats</b>	
Active Designers	Number of active Designer connections.
Requests / Sec	Number of requests running per second along with a trend showing the percentage of requests that completed in that time.
<b>Designer Sessions</b>	
Filter	Search criteria to filter for specific designer sessions.
View	The number of designer sessions to preview.
Id	Designer session id number.
User	Name of the user logged into the Designer.
Project	Name of project the user is currently working on.
Uptime	Amount of time the user is logged into the designer session.
Status	If the Designer is actively connected or not.
Address	The IP Address and name of the computer running the designer.
Memory	Current memory usage for the session.



## Designer Details

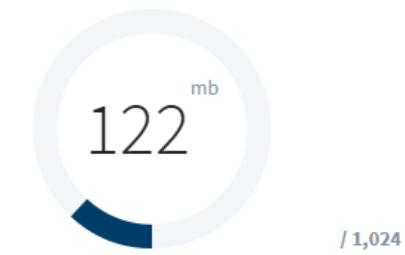
The Designer Details page shows more in depth information about that particular designer session, with the most important being the list of Designer Locks. The locks are project resources that the designer session is using. Because that designer session is using those project resources, no other designers will be able to access those resources, to prevent two designers from working on the same thing.

Attribute	Description
<strong>Session Details</strong>	
User	Name of the user logged into the Designer.
Project	Name of project the user is currently working on.
Address	The IP Address and name of the computer running the designer.
Uptime	Amount of time the user is logged into the designer session.
Memory	Current memory usage for the session.
Timezone	Local time of the user.
<strong>Log Activity</strong>	
Min Level	Dropdown menu with options Info, Debug, and Trace.
Live Values	Toggle switch to turn live values on or off.
Logger	Name of the logger that describes the context of the message.
Time	Time of log.
Message	Message for the log.

## Session Details

User	admin
Project	alarm-pipelines
Address	TR-89MC8R2-WS (10.10.110.54)
Uptime	22 minutes
Timezone	America/Los_Angeles [GMT-8:00]

## Memory



## Log Activity

Min level **INFO**Live Values 

Merge to Logs

## Logger

## Time

## Message

T Gateway

26Mar2019 14:42:27

Writing push notifications

## Related Topics ...

- [Designer](#)

# Connections - Devices

## Devices

The Devices page lists the currently configured OPC UA devices, and lets you know which are connected and which have a faulty connection. From here, you can drill into a device connection to see how many Tags Ignition is requesting from the device, along with how often it is requesting them. This information can be used to determine if we are overloading the device with too many requests too quickly, or if we can request more from our device.



## On this page ...

- [Devices](#)
  - [Devices Page](#)
  - [Device Details](#)

## Devices Page

The main Devices page lists out all OPC UA devices, as well as how many currently have a valid connection. Note: this will only show the devices connected through an Ignition device connection. For information about devices connected through other OPC Servers, see those programs.

Attribute	Description
Connected Devices	Number of devices connected out of configured devices.
Name	Name of the device.
Driver	Name of the device driver.
Status	Current device status.

A screenshot of the 'Devices' page. At the top, there's a summary box showing 'Connected Devices' with the value '4 / 5'. Below this is a navigation bar with 'Connections' and 'Devices' tabs, and a 'Configuration' button. A search bar labeled 'Filter type to filter' and a 'View 20' dropdown are also present. The main content area displays a table of connected devices with columns for 'Name', 'Driver', 'Status', and 'Actions'. The table shows three rows: CLX (ControlLogix, Connected: Protocol: EIP - Run Mode, Details), Dairy (DairyDemoSimulator, Connected, Details), and Generic (Simulator, Connected, Details). Navigation arrows at the bottom right indicate the table has one page with one item.

## Device Details

Clicking the **Details** button to the right will display a diagnostics page for that device which provides a lot of useful metrics like a Tag count. The log at the bottom of the page will display recent events that pertain to that particular device.

The Device Details page also lists statistics to help determine if the device is overloaded with requests. There are values for each Tag Group that are configured on Tags from the specified device, as well as aggregate statistics which pull from all Tag Groups to get an average for the device. The four values are listed in the table below.

Attribute	Description
<b>Aggregate Statics</b>	
Request Count	Tracks the number of requests that are coming in from the device, each request consisting of multiple Tags.  How many Tags are in a request can vary between devices, which Tags are being requested, and how often they are requested.
Throughput (Mean)	Average amount of requests that come through per second since the device was last started.  If the device connection is edited and saved, this will cause the device connection to reinitialize and this value will be reset.
Throughput (1 min)	Average amount of requests that come through per second for the last minute.
Mean Response Time	Average time it takes for Ignition to get a response from the device. This number should be an average of the graph on the right of the page.

So based on the statistics above, we can determine if we are overloading our device by requesting too many Tags too quickly. We simply need to take the throughput and use that to determine how many total requests come in per Tag Group execution. If this is at or above the request count, then our device can keep up with the numbers we are requesting. If it is below the request count, then the number of requests we are making to the device aren't coming in as fast as we want them, which can lead to poor device performance or bad values.

For example, take the image below. Scheduled at 2000ms, we have 81 requests. Our average throughput is about 40.8 requests a second. This means that every two seconds, we get 81.6 requests. Since we are making 81 requests every two seconds, this is exactly what we would expect to be getting from this device.

[Devices / Device \[MicroLogix\]](#)

### Aggregate Statistics

Details	
Request Count	81
Throughput (Mean)	69.33/sec
Throughput (1 min)	40.67/sec
Mean Response Time	9.82ms

**Tag Count**

3168

Time Range	Count
<3.4ms	15
<20.5ms	38
<37.6ms	30
<54.7ms	5

### Scheduled at 2000ms

Details	
Request Count	81
Throughput (Mean)	40.85/sec
Throughput (1 min)	40.82/sec
Mean Response Time	9.78ms

**Load Factor**

40 % / 100

Segment	Value
Blue	40
Red	25
Green	20
Yellow	15

### Log Activity

Min level: **INFO** Live Values: **ON** Merge to Logs: **OFF**

Logger	Time	Message
No log entries found		

## Overloaded Device

However, if we altered the Tag Group on the same device to 500ms, we see a very different picture. The request count is still 81, but because we are requesting values every 500ms, we should see about 162 requests coming through every second. The throughput values only show us getting about 87.5 requests per second, which is about half of what we actually are asking for. This would indicate that our device is overloaded, which can also be seen in the Load Factor. Our Tags would not be updating as quickly as we would like, which could lead to bad Tag values.

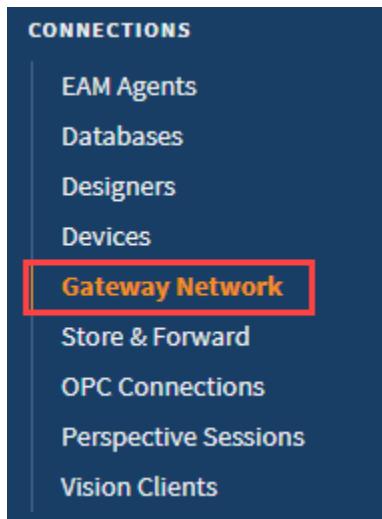


### Related Topics ...

- OPC UA
- Allen Bradley Ethernet
- Modbus
- Siemens

# Connections - Gateway Network

The Gateway Network Status page is designed to give a quick overview of the status of all Gateways within the Gateway Network. If a Gateway connection is faulted, the status message in red can be selected to see the error that pertains to why it is faulted. Any Gateway connections with a status of 'Connected' can be drilled into by clicking the **Details** button to the right. On the Details page, metrics for the selected Gateway connection are displayed, giving an idea of the rate of data transfer between the two Gateways, as well as a list of recent connection events.



## On this page ...

- [Gateway Network Page](#)
- [Gateway Area Network Connection Details](#)
  - [Active Outgoing and Incoming Tasks List](#)
  - [Gateway Network Statistics](#)
  - [Outgoing Queues](#)
  - [Temporary Queue Actions](#)
  - [Outgoing and Incoming Tasks Statistics](#)

## Gateway Network Page

The main Gateway Network page displays a list of all current Gateway Network connections both incoming and outgoing, as well a list of all Remote Gateways that the Local Gateway can see both from its Gateway Network connections and through proxy connections. Each list has some basic information along with the ability to see more details on a specific Gateway Network connection or a Remote Gateway.

Attribute	Description
<b>Gateway Network Connections</b>	
Remote Gateway	Name of the Remote Gateway connection.
Direction	The direction of the Gateway Network connection. Can either be Incoming or Outgoing.
Redundancy Role	The redundancy role of the Gateway. Can either be Independent, Backup, or Master.
Last Comm	The time of the last communication with the Gateway.
Ping Time	Reaction time of Gateway connection. How fast you get a response after you've sent out a request.
Status	Current state of the Gateway Network Connection.
Fault Count	Number of times the connection has faulted since the Gateway has been started.
<b>Remote Gateways</b>	
Gateway Name	Name of the Remote Gateway.
Outgoing Msg/Sec	The number of outgoing messages per second.
Incoming Msg/Sec	The number of incoming messages per second.
Pending	Number of messages pending in a queue that are waiting to be dispatched to the Gateway Network connection.
Connected Through	How the Gateway is connected to the Remote Gateway.
Status	Current state of the Remote Gateway Connection.

Status > Connections > **Gateway Network**

[Configuration](#)

## Connections

« < 1 of 1 > »

Remote Gateway ▾	Direction	Redundancy Role	Last Comm	Ping Time	Status	Fault Count	Actions
ignition-mrobertson-lt4	Incoming	Independent	a few seconds ago	N/A	<span>Running</span>	0	<a href="#">Details</a>
ignition-dartmouth-backup-backup	Incoming	Backup	a few seconds ago	N/A	<span>Running</span>	0	<a href="#">Details</a>
controller	Incoming	Independent	a few seconds ago	N/A	<span>Running</span>	0	<a href="#">Details</a>

« < 1 of 1 > »

## Remote Gateways

« < 1 of 1 > »

Gateway Name ▾	Outgoing Msg/Sec	Incoming Msg/Sec	Pending	Connected Through	Status	Actions
Ignition-mrobertson-lt4	0.3	0.3	0	ignition-mrobertson-lt4	<span>Connected</span>	<a href="#">Details</a>
Ignition-ignition8-ubuntu-64bit	0.0	0.0	0	ignition-mrobertson-lt4	<span>Connected</span>	<a href="#">Details</a>

## Gateway Area Network Connection Details

Ignition's Gateway Network system shares information across Gateways using threads to send and receive information. For example, if you have a Remote Tag Provider configured between Gateway A and Gateway B, messages containing live tag information will be sent between these two Gateways using threads to send and receive live tag data. Similarly, a Remote Historical Tag Provider will send/receive messages with historical tag data between Gateway A and Gateway B using this same set of threads. Each Ignition sub system that uses the Gateway Network will utilize these threads in some way.

Ignition's Gateway Network also has a queue associated with each Ignition subsystem. These queues allow for Ignition to have a way to prioritize which sub system should have access to a send or receive thread. Prioritization here is especially important because if all send threads are in use, messages cannot be sent between two Gateways. The Gateway Network page includes additional information that will help better monitor Gateway interactions.

Home Status > Connections > Gateway Network

Configuration

## Connections

« < 1 of 1 > »

Remote Gateway ▲	Direction	Redundancy Role	Last Comm	Ping Time	Status	Fault Count	Actions
gateway+b	Outgoing	Independent	a few seconds ago	1 ms	<span>Running</span>	0	<span>Details</span>

« < 1 of 1 > »

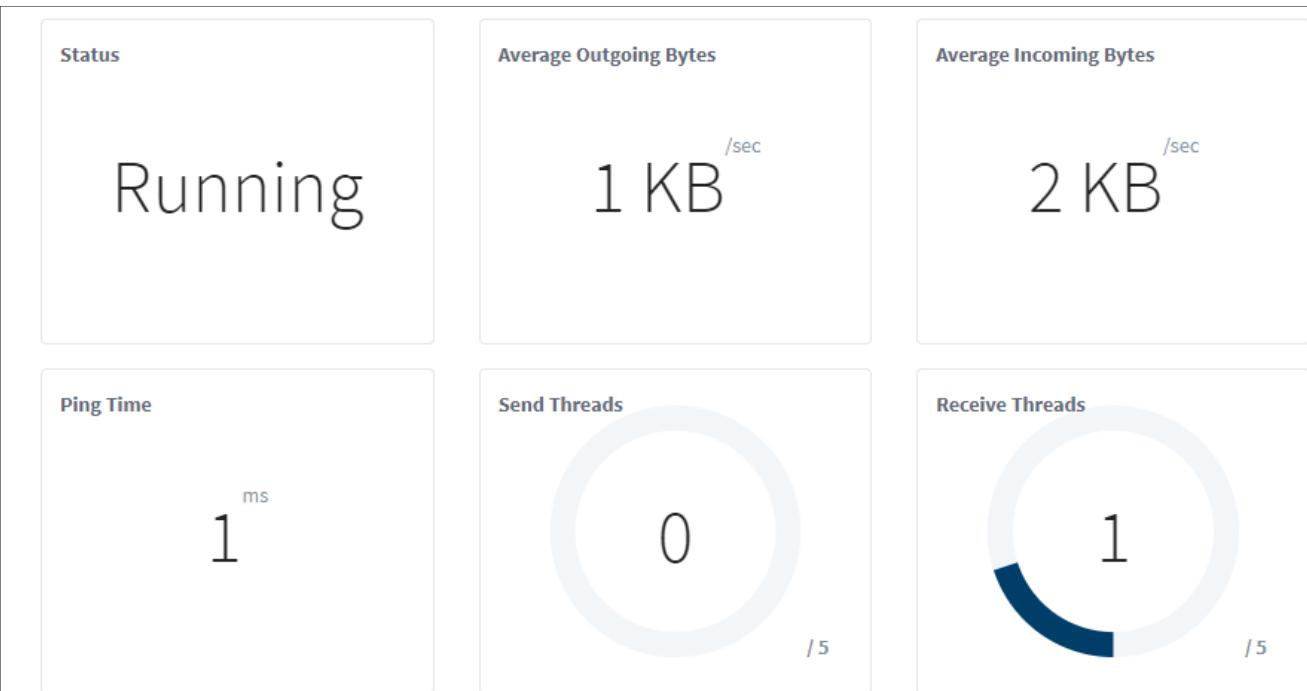
## Remote Gateways

« < 1 of 1 > »

Gateway Name ▲	Outgoing Msg/Sec	Incoming Msg/Sec	Pending	Active	Connected Through	Status	Actions
Gateway B	0.5	1.2	0	0	gateway+b	<span>Connected</span>	<span>Details</span>

« < 1 of 1 > »

The image above shows the basic Gateway Network Connection Status page where we can see there is an outgoing Gateway Network connection from Gateway A to Gateway B. Pressing the Details button will bring up detailed information about this connection as below:



### Active Outgoing Tasks

<u>Task Name</u> ▾	<u>Source Queue</u>	<u>Duration Secs</u>
CallResult:Services/Get Service State	Call Results Queue	30354
CallResult:Services/Get Service State	Call Results Queue	401254
CallResult:Services/Get Service State	Call Results Queue	554102

### Active Incoming Tasks

<u>Task Name</u> ▾	<u>Duration Secs</u>
No items to display.	

Attribute	Description
Status	Current state of the Gateway Network Connection.
Average Outgoing Bytes	Average bytes of data going from the Local Gateway to the Remote Gateway per second.
Average Incoming Bytes	Average bytes of data going from the Remote Gateway to the Local Gateway per second.
Ping Time	Reaction time of Gateway connection. How fast you get a response after you've sent out a request.
Active	Number of messages being actively processed by the gateway network connection.
Send Threads	A thread that is used by the Gateway Network to upload messages from one gateway to another.
Receive Threads	A thread that is used by the Gateway Network to download messages from one gateway to another.
Local Id	Id of the local Gateway.
Remote Id	Id of the remote Gateway.
Remote Gateway	Name of the Gateway on the Gateway network.
Network Address	Physical address used to communicate with all devices on the Gateway network.
Redundant Role	The redundancy role of the Gateway. Can either be Independent, Backup, or Master.
Direction	The direction of the Gateway Network connection. Can either be Incoming or Outgoing.
Session Id	Gateway connection session Id number. Connected gateways use the same session Id on both gateways.
Last Comm	The time of the last communication with the Gateway.

Fault Count	Number of times the connection has faulted since the Gateway has been started.
Connection Events	Displays a list of recent connection events.

## Active Outgoing and Incoming Tasks List

Attribute	Description
Task Name	Name of the task that is using a thread.
Source Queue	The Ignition sub system queue that dispatched this task.
Duration Secs	This is how long in seconds it takes for a task to be performed.

## Gateway Network Statistics

In addition to showing live thread and task information, users can also keep track of Gateway Network Statistics. By clicking on the Details button below, the Gateway Network Statistics Page appears for Gateway B:

Remote Gateway	Direction	Redundancy Role	Last Comm	Ping Time	Status	Fault Count	Actions
gateway+b	Outgoing	Independent	a few seconds ago	1 ms	<span>Running</span>	0	<span>Details</span>

Gateway Name	Outgoing Msg/Sec	Incoming Msg/Sec	Pending	Active	Connected Through	Status	Actions
Gateway B	0.5	1.2	0	0	gateway+b	<span>Connected</span>	<span>Details</span>

## Outgoing Queues

The Gateway Network Statistics page has three sections associated with it. First, the Outgoing Queues section. The Outgoing Queues section shows tasks that are both in a pending and active state. A pending task is a task that has not yet been dispatched to the gateway network thread pool. An active task is a task that is being processed by the gateway network thread pool and should show up under the Gateway Network Connection Status page as either an outgoing or incoming task.

## Outgoing Queues

Name ▲	Priority	Inserts/Sec	Pending	Active	Avg Pending Secs	Total	Actions
Call Results Queue	Highest	0.5	0	0	0.0	333,299	<button>More ▾</button> <button>Clear</button>
Default Queue	Normal	0.0	0	0	0.0	2	<button>More ▾</button> <button>Clear</button>
Long Wait Queue	Low	0.0	0	0	0.0	0	<button>More ▾</button> <button>Clear</button>
Proxy Queue	AboveNormal	0.0	0	0	0.0	0	<button>More ▾</button> <button>Clear</button>
Tag Value Publishing	Normal	0.0	0	0	0.0	0	<button>More ▾</button> <button>Clear</button>

Attribute	Description
Name	Name of the queue.
Priority	Level of priority for a queue.
Inserts/Sec	Rate of task inserts per second for a queue
Pending	Number of pending tasks in a queue that have not yet been dispatched to a Send/Receive thread.
Active	Number of messages being actively processed by the gateway network connection.
Avg Pending Secs	Average number of seconds that a task has been pending in a queue.
Total	Total number of tasks executed from this queue.
Actions	Set of actions associated with a queue. Users can both Pause and Clear a queue.

## Temporary Queue Actions

The Gateway Network Statistics page has controls for pausing and clearing a queue. To **pause** a queue means no new tasks will be allowed to be inserted into the paused queue. To **clear** a queue means that all pending tasks will be purged. These actions are designed to help the user deal with a possibly overloaded gateway network connection due to a specific sub system flooding the queue with more tasks than the connection can handle. Note that neither of these actions will have any effect on active tasks, as they have already been dispatched to the gateway network connection and cannot be cancelled.

## Outgoing Queues

Name ▲	Priority	Inserts/Sec	Pending	Active	Avg Pending Secs	Total	Actions
Call Results Queue	Highest	0.5	0	0	0.0	333,313	<button>More ▾</button> <button>Clear</button>
Default Queue	Normal	0.0	0	0	0.0	2	<button>Pause</button> <button>More ▾</button> <button>Clear</button>
Long Wait Queue	Low	0.0	0	0	0.0	0	<button>More ▾</button> <button>Clear</button>

## Outgoing and Incoming Tasks Statistics

The Outgoing and Incoming Task Statistics section shows individual tasks that have been processed by the Gateway Network Connection.

## Outgoing Task Statistics

Name ▲	Description	Queue	Invocations/Sec	Avg Duration Secs	Total
Remote Tags (v7)/getProviders	Returns a list of tag providers	Remote Tags (v7)	0.0	0.3	1
Remote Tags/cancelSubscription	Cancel a remote tag subscription	Remote Tags	0.0	0.4	1
Remote Tags/getProperties	Return a list of tag provider properties for a specified provider	Remote Tags	0.0	0.4	2
Remote Tags/modifySubscription	Modify a remote tag subscription	Remote Tags	0.0	0.4	1
Remote Tags/validateSubscription	Validates that tag subscriptions between gateways is synchronized	Remote Tags	0.1	0.6	39
Services/Enumerate Services	Returns a list of available services on a remote machine	Default Queue	0.0	0.7	12
Tag History Storage Service/canAcceptData	Indicates whether the local historian can store new data	Tag History Storage Service	0.0	0.4	1
Tag History/getHistoricalProviders	Returns a list of historical providers	Tag History	0.0	0.3	1

## Incoming Task Statistics

Name ▲	Description	Invocations/Sec	Avg Duration Secs	Total
CallResult:Remote Tags (v7)/getProviders	Returns a list of tag providers	0.0	0.0	1
CallResult:Remote Tags/cancelSubscription	Cancel a remote tag subscription	0.0	0.0	1
CallResult:Remote Tags/getProperties	Return a list of tag provider properties for a specified provider	0.0	0.0	2
CallResult:Remote Tags/modifySubscription	Modify a remote tag subscription	0.0	0.0	1
CallResult:Remote Tags/validateSubscription	Validates that tag subscriptions between gateways is synchronized	0.1	0.0	39
CallResult:Services/Enumerate Services	Returns a list of available services on a remote machine	0.0	0.0	10
CallResult:Tag History Storage Service/canAcceptData	Indicates whether the local historian can store new data	0.0	0.0	1
CallResult:Tag History/getHistoricalProviders	Returns a list of historical providers	0.0	0.0	1

Outgoing and Incoming Tasks Attributes	Description
Name	Name of a task.
Description	Description for a task.
Queue	Queue invoking a task (For Outgoing Tasks only)
Invocation/Sec	Rate at which a task is invoked per second.
Avg Duration Secs	Average duration in seconds of the time it takes for this task to execute.
Total	Number of times the task has been executed in total.

**Note:** If you are looking for connection details for Ignition version 8.0.14 and earlier, refer to [Connections - Gateway Network](#) page in version 8.0 of the Ignition User Manual.

## Related Topics ...

- [Gateway Status](#)
- [Diagnostics - Logs](#)

# Connections - Store & Forward

## Store & Forward

The [Store and Forward](#) page displays a list of the Store and Forward engines, including their status, as well as the number of records currently in each Store and Forward system. If the database connection becomes faulted, the database records wait in the Store and Forward system until the database connection is restored.



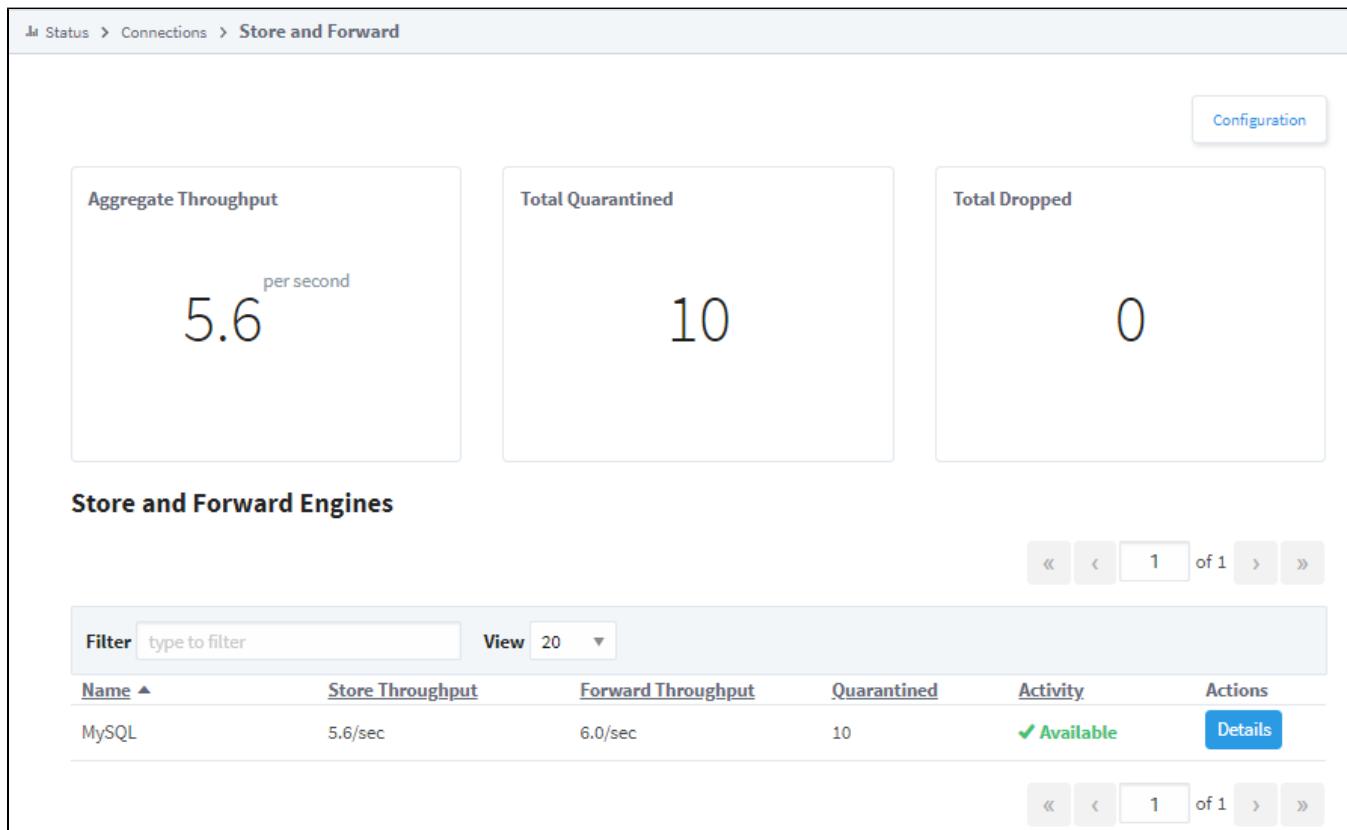
## On this page ...

- [Store & Forward](#)
  - [Store & Forward Page](#)
  - [Store & Forward Details](#)

## Store & Forward Page

The main Store and Forward page lists out all store and forward engines. Typically, each database connection gets its own store and forward engine, so there should be one engine for each database connection. In addition to displaying some basic stats for each engine, you can also find some totals for all store and forward systems, to get an idea of how much data is being pushed through the system to databases and if any records are being dropped.

Attributes	Description
<strong>Store and Forward Connections</strong>	
Aggregate Throughput	Aggregate number of records inserted into a database from any Store and Forward engine per second.
Total Quarantine	Number of quarantined items for all Store and Forward engines.
Total Dropped	Number of records dropped from the Store and Forward engines. A record is considered dropped if it can not be added to one of the buffers, (i.e., when a buffer is full and the Store and Forward engine can no longer accept new records).
<strong>Store and Forward Engines</strong>	
Name	Name of the Store and Forward engine.
Store Throughput	Number of records that go through the Store and Forward Engine per second.
Forward Throughput	Number of records to be forwarded on to the database per second.
Quarantined	Is data that has errored-out multiple times during attempts to forward it, or data that could not be stored because of some configuration issues.
Activity	Current state of the Store and Forward engine.
Actions	By clicking Details, shows additional information about Store and Forward engines.



## Store & Forward Details

Clicking the **Details** button brings up a new window that will show even more details about the records in the selected Store and Forward Engine. Here, we can see a count of the number of records in the memory buffer and local cache, as well as the number of quarantined records. The quarantined items at the bottom of the Details page will have some buttons that allow you to [control the data that is in the quarantine](#). The quarantined item can be retried, where it will be thrown back through the Store and Forward system to see if it will go through properly, assuming the original reason why it was quarantined has been fixed. It can also be deleted so that it is no longer taking up space in the Store and Forward system, or exported to your local machine where you can save it to try again later. You can then import the file back from the same page when you resolved the issue that caused the data to be quarantined in the first place.

Attribute	Description
Memory Buffer	Number of records entering the Memory Buffer per second. The progress bar shows the percent of the buffer being utilized, along with the current and max number of records.
Local Cache	Number of records entering the Local Cache per second. An "Idle" state means the engine is able to successfully store all records into the database before the <b>Write Size</b> or <b>Write Time</b> values have been reached. The progress bar shows the percent of the buffer being utilized, along with the current and max number of records.
Database Storage	Displays the number of records pushed from either buffer to the database per second.
Quarantine d Items	Shows a list of quarantine items and allows you to choose the quarantined file and import it.
ID	Identification number of the quarantine item.
Count	Number of occurrences for the quarantined item.
Description	Description of where the quarantine item originated from.
Reason	Explanation why the record was placed into quarantine.
Actions	Provides and opportunity to retry, delete, or export the items from quarantine.

Status > Connections > Store and Forward

Configuration

### Store Details

Memory Buffer	Local Cache	Database Storage
6 /sec	1 /sec	6 /sec
2% (5/250)	0% (0/25000)	

### Quarantined Items

Import quarantine file

Retry All

Delete All

« < 1 of 1 > »

ID	Count	Description	Reason	Actions
1	10	SQLTag History Data	This data sink does not accept data of the given type.	<a href="#">Retry</a> <a href="#">Delete</a> <a href="#">Export</a>

« < 1 of 1 > »

Related Topics ...

- [Using Store and Forward](#)
- [Controlling Quarantine Data](#)

# Connections - OPC Connections

## OPC Connections

The OPC Connections page displays all currently configured OPC (both UA and DA) connections.



If you are using an OPC UA connection, you should be using the [OPC UA Module](#). If you are using the DA connection, you should be using the [OPC COM Module](#).



## On this page ...

- [OPC Connections](#)
  - [OPC Connections Page](#)
  - [Nodes](#)

## OPC Connections Page

Here on the main OPC Connections page, we can see a list of all current OPC connections, as well as their status. If any are faulted, you can click the red faulted status to get an error message popup with a full description of the error.

Attribute	Description
Connected Servers	Displays the list of OPC servers out of configured servers, and their status.
Name	OPC server name.
Filter	Search criteria to filter for specific server names.
Type	OPC server type - UA or DA
Uptime	Total time OPC server is connected.
Status	Current status of OPC server.
Diagnostics	Displays diagnostic information for any connected OPC UA server. <ul style="list-style-type: none"><li>• Server - Shows server diagnostics.</li><li>• Client - Shows client connection subscription diagnostics.</li></ul>

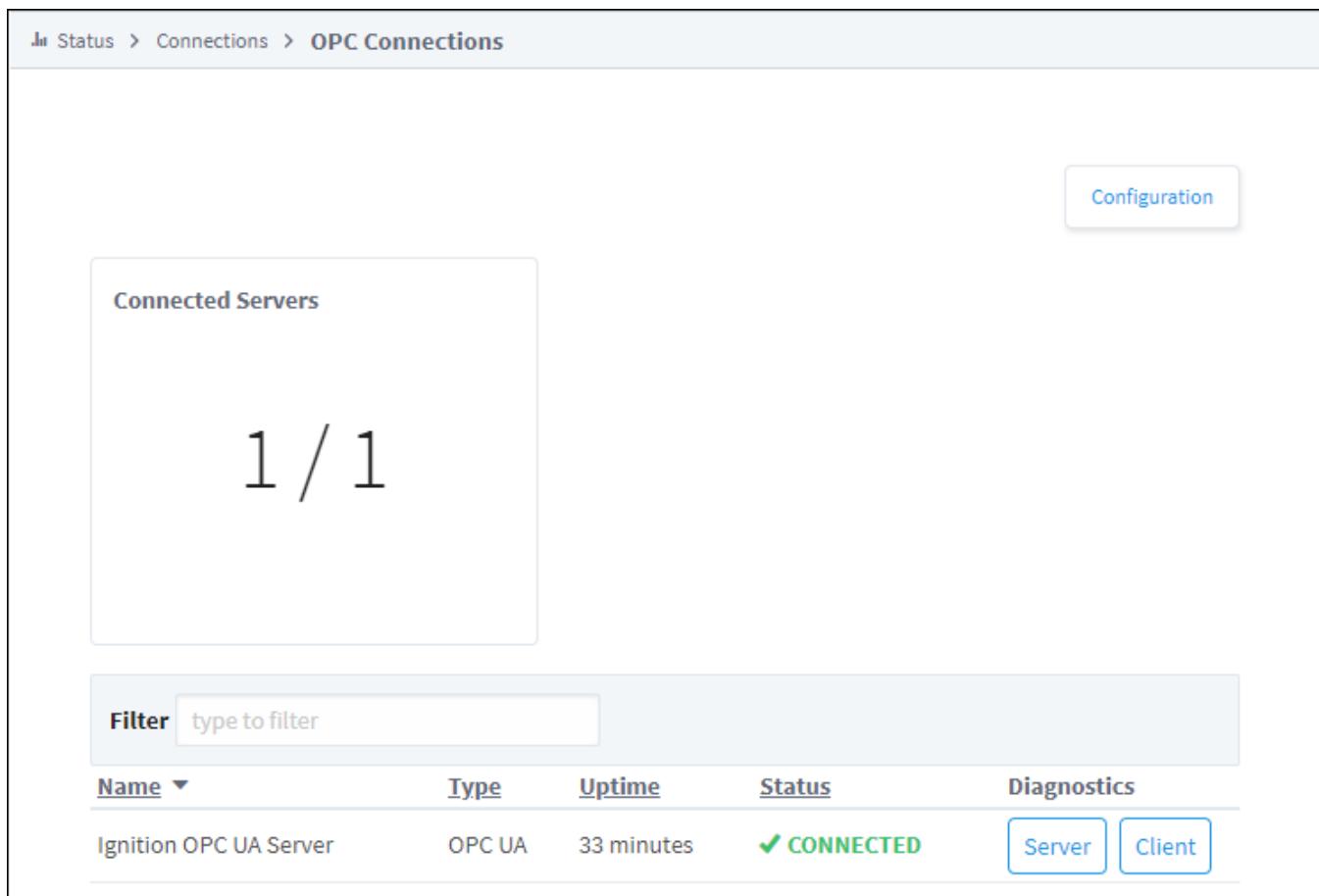
» Status > Connections > OPC Connections

Configuration

Connected Servers  
1 / 1

Filter type to filter

Name ▾	Type	Uptime	Status	Diagnostics
Ignition OPC UA Server	OPC UA	33 minutes	✓ CONNECTED	<a href="#">Server</a> <a href="#">Client</a>



## Server

Click the **Server** button to get information on the server. By default, diagnostics are set to off since they can generate a considerable amount of network overhead and impact performance. To turn on diagnostics, click **Enable Diagnostics**. Not all OPC UA servers support diagnostics.

[Configuration](#)

## Ignition OPC UA Server

[← Return to Servers](#)[Server Information](#)[Session Diagnostics](#)

### Server Status

Parameter ▾	Value
currentTime	2020-07-10T10:37:36.900-07:00
startTime	2020-07-09T09:35:29.474-07:00
state	CONNECTED

### Build Info

Parameter ▾	Value
buildDate	2020-07-09T09:35:28.127-07:00
buildNumber	dev
manufacturerName	Inductive Automation
productUri	urn:inductiveautomation:ignition:opcua:server
softwareVersion	dev

### Server Diagnostics

[Enable Diagnostics](#)

This server does not have diagnostics enabled.

### Clients

By clicking on the **Client** button, it brings up the subscription information for that particular server. It will list out all of the subscriptions to that server with the publishing rates, as well as the number of items within that subscription.

Attribute	Description
Filter	Search criteria to filter for specific subscriptions.
Refresh	Refreshes subscription data.
Name	Displays the subscription name.
Rate	The rate defined in the Tag Group, used as the requested sampling interval for monitored Items belonging to the corresponding subscription.
Request Publishing Interval	The rate a subscription will report accumulated change notifications at. The interval is derived from Rate, unless explicitly defined.
Revised Publishing Interval	The server's revised rate for accumulated change notifications.
Tag Count	The number of Tags currently subscribed to that Tag Group.

! Status > Connections > OPC Connections > Ignition OPC UA Server - Subscriptions

Configuration

### Ignition OPC UA Server

Name	Rate	Request Publishing Interval	Revised Publishing Interval	Tag Count	
tag-group-exporttags_default	10000	1000	1000	3	<button>Nodes</button>
tag-group-default_time driven	60000	1000	1000	2	<button>Nodes</button>
tag-group-default_driven machine state	10000	1000	1000	2	<button>Nodes</button>
tag-group-default_direct 5 seconds	5000	1000	1000	4	<button>Nodes</button>
tag-group-default_direct	1000	500	500	2	<button>Nodes</button>
tag-group-default_default	10000	1000	1000	188	<button>Nodes</button>

## Nodes

Clicking the **Nodes** button for one of the subscriptions will bring up the list of subscribed OPC items.

Attribute	Description
Filter	Search criteria to filter for a specific node.
Refresh	Refreshes node data.
Node ID	The OPC item path.
Requested Sampling Interval	The rate the underlying tag/node will be polled at.
Revised Sampling Interval	The revised rate at which the underlying tag/node will be polled at.
Requested Queue Size	Determines how many data points can be stored and transferred to the client once the sampling rate elapses when the sampling rate is slower than the publishing rate.
Status Code	Status of the node.

Configuration

### Ignition OPC UA Server > tag-group-default\_driven machine state-unleased

Node ID ▾	Requested Sampling Interval	Revised Sampling Interval	Requested Queue Size	Revised Queue Size	Status Code
ns=1;s=[Generic]_Meta:Sine/Sine9	10000	10000	1	1	Good
ns=1;s=[Generic]_Meta:Sine/Sine8	10000	10000	1	1	Good
ns=1;s=[Generic]_Meta:Sine/Sine0	10000	10000	1	1	Good
ns=1;s=[Generic]_Meta:Ramp/Ramp9	10000	10000	1	1	Good
ns=1;s=[Generic]_Meta:Ramp/Ramp8	10000	10000	1	1	Good
ns=1;s=[Generic]_Meta:Ramp/Ramp7	10000	10000	1	1	Good

#### Related Topics ...

- [OPC UA](#)
- [OPC UA Client Connection Settings](#)

# Connections - SECS/GEM Equipment

## SECS/GEM Equipment

The SECSGEM Equipment page displays a list of all equipment connections, their status, as well as the number of sent requests and received messages. If any piece of equipment becomes faulted, it will show a status of "Not Connected." If you click the **Details** button, it opens a new page with some Connection Stats. Note: the SECSGEM Module is not standard and will be missing for most installs of Ignition. The SECSGEM Equipment Connection will only be displayed in the Status section of the Gateway webpage under Connections when the module is installed.



## On this page ...

- SECS/GEM Equipment
  - SECS/GEM Equipment Page
  - SECS/GEM Equipment Details

## SECS/GEM Equipment Page

The main SECS/GEM Equipment page lists out all equipment connections and displays the number of messages sent between them and Ignition.

Attribute	Description
Connections	The total number of active SECS/GEM Equipment connections.
Aggregate Throughput	The messages per second the system is sending and receiving from all devices at that time.
Name	The name of the equipment connection in the list.
Sent Messages	The number of messages sent to the equipment.
Received Messages	The number of messages received from the equipment.
Status	The status of the equipment.

A screenshot of the SECSGEM Equipment page. At the top, there is a breadcrumb navigation: Status &gt; Connections &gt; SECSGEM Equipment. On the right, there is a 'Configuration' button. Below the breadcrumb, there is a section titled 'Equipment Stats' with two cards: 'Connections' (value: 1) and 'Aggregate Throughput' (value: 0.2 per second). At the bottom, there is a table with columns: Name, Sent Messages, Received Messages, and Status. One row in the table shows 'SimEquipOne' with '154' in the Sent Messages column, '77' in the Received Messages column, and a green checkmark in the Status column indicating 'Communicating'. There is also a 'Details' button next to the status column.

## SECS/GEM Equipment Details

Clicking the **Details** button to the right of a piece of equipment will take you to a page that shows more detailed information for that particular piece of equipment.

Attribute	Description
<b>Sent Messages</b>	
Throughput	The messages per second the system is currently sending.
Average	The average messages sent per second from when the equipment was first enabled.
Total	The total messages sent.
<b>Received Messages</b>	
Throughput	The messages per second the system is currently receiving.
Average	The average messages received per second from when the equipment was first enabled.
Total	The total messages received.

Status > Connections > SECS/GEM Equipment

Configuration

### Connection Stats

#### Sent

Last to: S1F14

Throughput	Average	Total
0.1 per second	0.0 per second	166

#### Received

Last from: S1F13

Throughput	Average	Total
0.1 per second	0.0 per second	83

This screenshot shows the 'Connection Stats' section of the SECS/GEM Equipment Details page. It displays two sets of metrics: 'Sent' and 'Received'. Under 'Sent', it shows 'Last to: S1F14' with three cards: 'Throughput' (0.1 per second), 'Average' (0.0 per second), and 'Total' (166). Under 'Received', it shows 'Last from: S1F13' with three cards: 'Throughput' (0.1 per second), 'Average' (0.0 per second), and 'Total' (83). The page also includes a 'Configuration' button in the top right corner.

Related Topics ...

- SECS/GEM

# Connections - Perspective Sessions

## Perspective Sessions

Much like the Designers page, the Perspective Sessions page shows a ton of information regarding currently open Sessions. All the open Perspective Sessions are displayed on the page along with some basic information about each session, such as what user is logged into each session and the project they are currently working on, their IP address, and much more. Each session has a Details button that allows you navigate all the elements of a session: pages, view instances, and components.



## On this page ...

- Perspective Sessions
  - Perspective Sessions Page
  - Perspective Session Details
  - View Instances
  - Components

## Perspective Sessions Page

The main Perspective Sessions page displays a list of all currently running Designer and Client Sessions to show how many are open, and the name of the users that are currently using them. By clicking on the **Details** button to the right of a session will display even more information about that particular session, including any Log Activity pertaining to errors recorded while the session was active.

Attributes	Description
<b>Sessions Details</b>	
Total Sessions	The number of currently active Designer and Perspective Sessions.
Device	Type of device running the Session.
User	The user logged into the Session.
Project	The name of the project open in the Session.
Uptime	The total uptime of the Session.
Last Comm.	Date and time recorded for the last communication with the Session.
Address	The IP Address and computer name where the Session is launched.
Session Scope	Indicates what browser opened the Session, and the Perspective icon indicates the Designer is open.
Actions	Displays more details about the session.

Status > Connections > Perspective Sessions

### Session Stats

**Total Sessions**  
  
**2**

### Session Details

Device ▾	User	Project	Uptime	Last Comm.	Address	Session Scope	Actions
Windows 10	admin	TestProject	a minute	a few seconds	0:0:0:0:0:0:1		<a href="#">Details</a>
Windows 10	admin	TestProject	8 hours	a few seconds	TR-563JBZ1-WS (127.0.0.1)		<a href="#">Details</a>

### Perspective Session Details

The Performance Page within the session displays more in depth information such as the Page Id and how many views are on each Page. Hit the **Details** button to get more detailed information about each page in the session.

Attributes	Description
<b>Performance</b>	
Total Views	The number of currently active pages.
Total Bytes Sent	Displays total number of bytes sent out.
<b>Pages</b>	
Id	Page Id
Views	Displays total number of views on a page.
Actions	Displays the details of the view instances in the session.
<b>Log Activity</b>	
Min level	Dropdown menu with options Info, Debug, and Trace.
Live Values	Toggle switch to turn live values on or off.
Merge to Logs	Merge the settings of the current view with the main Diagnostics Log Viewer.
Logger	Name of the logger that describes the context of the message.
Time	Time of log.
Message	Message for the log.
(Log Properties)	Displays log properties of the logged event.

## Performance

Total Views

2

Total Bytes Sent

60 MB

## Pages

<u>Id</u> ▾	<u>Views</u>	<u>Actions</u>
2c3e945	2	<a href="#">Details</a>

## Details

### Session Details

User	Unauthenticated
Project	Perspective
Device	Windows NT 10.0; Win64; x64
Address	0:0:0:0:0:0:1
Uptime	20 hours
Last Comm.	a few seconds
Session Scope	

## Log Activity



Min level	INFO	Live Values	Merge to Logs
	▼	ON	
Logger	Time	Message	
DesignSession	29Mar2019 10:37:26	Socket connected to session. pageld=nav topbar	
DesignSession	29Mar2019 10:37:21	Socket connected to session. pageld>New View	
ClientSession	29Mar2019 09:45:04	WebSocket disconnected from session.	

## View Instances

The View Instances page shows the number of View Instances on a Page and the number of Components in each view instance. Press the **Details** button next to each View Instance to get even more information about the type of components used in each view.

Attributes	Description
<b>Sessions Details</b>	

InstanceID	Displays View Instances for each view.
Components	Total number of components used in the specified view.
Actions	By clicking on the Details button shows more information for each view instance.

The screenshot shows a table titled "View Instances" with three columns: "Instance ID", "Components", and "Actions". The "Instance ID" column contains "nav topbar@T[0]" and "New View@C". The "Components" column contains the value "7" for both rows. The "Actions" column contains a blue "Details" button for each row. The table is set against a background of a web application interface with a header bar.

Instance ID	Components	Actions
nav topbar@T[0]	7	<a href="#">Details</a>
New View@C	7	<a href="#">Details</a>

## Components

The Components page lists all the components used in a View Instance of Page along with the following information about each component.

Attributes	Description
Name	Name of the component.
AddressPath	Address of the component.
Bindings	Displays the number of bindings for each component.
Children	Displays the number of children for each component.
Properties	Displays the number of properties for each component.
PropertyChangeScripts	Displays the number of property change scripts for each component
Actions	Displays the number of actions for each component.

## Components

Name ▾	Address Path	Bindings	Children	Properties	Property Change Scripts	Actions
LedDisplay_2	0:15	1	0	4	0	0
LedDisplay_1	0:9	1	0	4	0	0
LedDisplay_0	0:8	1	0	4	0	0
LedDisplay	0:7	1	0	4	0	0
Label_3	0:14	0	0	4	0	0
Label_2	0:10	0	0	4	0	0
Label_1_0	0:6	0	0	4	0	0
Label_1	0:5	0	0	4	0	0
Label_0	0:4	0	0	4	0	0
Label	0:3	0	0	4	0	0
CylindricalTank_3	0:2	1	0	4	0	0
CylindricalTank_0	0:1	1	0	4	0	0
CylindricalTank	0:0	1	0	4	0	0
Button_0_0	0:13	0	0	4	0	0
Button_0	0:12	0	0	4	0	1
Button	0:11	0	0	4	0	1

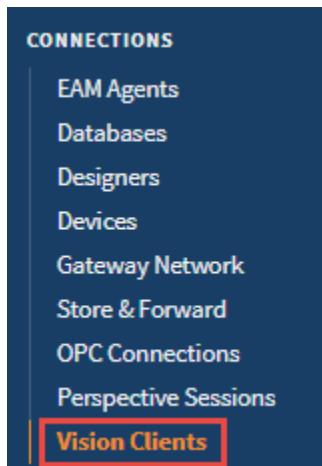
### Related Topics ...

- [Launching a Perspective Session](#)

# Connections - Vision Clients

## Vision Clients

Much like the Designers page, the Vision Clients page shows information regarding currently opened Clients. The Clients are listed and show some basic information such as the address of the Client. From here, the Client session can be terminated by selecting the **More** button and hitting **Terminate**, or select the **Details** option to see more details about the Client session such as the number of Tags that the session is currently subscribed to, as well as a log of errors that may have happened with that Client.



## On this page ...

- [Vision Clients](#)
  - [Vision Clients Page](#)
  - [Client Session Details](#)

## Vision Clients Page

The main Vision Clients page displays a list of all currently running Clients which show how many clients are open and what users are currently using them.

Attributes	Description
<b>Clients Stats and Details</b>	
Active Clients	The number of currently active Clients.
Requests/sec	The number of requests per second coming from all Clients.
Id	The Client Id.
User	The user logged in on the Client session.
Project	The name of the project open in the Client session.
Uptime	The total uptime of the Client session.
Activity	Denotes whether the Client session is currently connected and active or not.
Address	The IP Address and computer name where the Client is launched.
Memory	The Client's current memory usage.
Actions	The option to terminate the Client session, or see more details about the session.

Status > Connections > Vision Clients

### Client Stats

Active Clients

1

Requests / sec

5.1

### Client Details

Filter <input type="text" value="type to filter"/>						View <input type="button" value="10"/>	
<u><a href="#">Id</a></u> ▾	<u><a href="#">User</a></u>	<u><a href="#">Project</a></u>	<u><a href="#">Uptime</a></u>	<u><a href="#">Activity</a></u>	<u><a href="#">Address</a></u>	<u><a href="#">Memory</a></u>	<u><a href="#">Actions</a></u>
38638402	admin	NewProject	18 minutes	<span style="color: green;">✓ Active</span>	ws3 (127.0.0.1)	68mb	<a href="#">More</a> <a href="#" style="background-color: blue; color: white; border: 1px solid black; padding: 2px 5px;">Details</a>

1 items 1 of 1

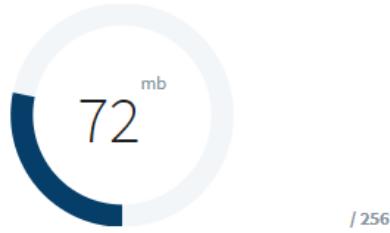
## Client Session Details

Clicking on the **Details** button for a Client session will take you to a page that displays more in depth information for that particular Client session. It also gives a logger at the bottom where errors coming from that particular Client can be seen.

Attributes	Description
<b>Client Performance and Details</b>	
Memory	The Client's current memory use.
Subscriptions	The number of Tags the Client is currently subscribed to.
User	The user logged in on the Client session
Project	The name of the project open in the Client session.
Address	The IP Address and computer name where the Client is launched.
Uptime	The total uptime of the Client session.
Last Comm	The last time the Gateway communicated with the Client.
Client JVM Version	The Java version that the Client is currently running on.

## Performance

Memory



Subscriptions

8 tags

## Details

Session Details

User	admin
Project	NewProject
Address	ws3 (127.0.0.1)
Uptime	34 minutes
Last Comm	485ms
Client JVM Version	11.0.2

Related Topics ...

- [Vision Client Launcher](#)

# Diagnostics - Execution

The Execution page reports the status of all tasks that your [Gateway](#) runs on a schedule. Here you can find helpful information such as the duration and execution time of an [alarm](#) journal update or the average time it takes your [Gateway](#) to execute a [Tag Group](#).

Attributes	Description
Throughput	Number of executions that come through per second.
Total Executions	Total number of times the task executed.
Delay	Amount of time waiting to execute the task.
Avg. Duration	Average time to run the task.
Last Duration	Amount of time to run the last task.

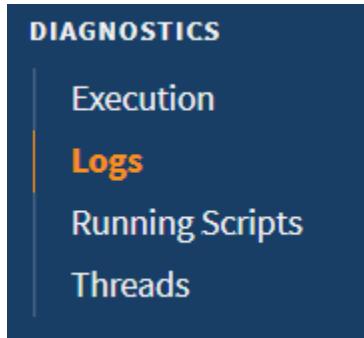
Shared Execution Engine						
Owner / Tasks	Throughput	Total Executions	Delay	Avg. Duration	Last Duration	
databaseconnectionmanager						
txtimoutdaemon	0.500 exec/sec	3,639	2 sec	0 millis	0 millis	
eam						
agentupdate	0.999 exec/sec	7,258	1 sec	0 millis	0 millis	
emailackmanager						
orphanedacknowledgementcleanup	idle	122	1 min	0 millis	0 millis	
gateway						
license-checker	idle	114	1 min	4 sec	4 sec	
logfile cleanup	idle	1	2 hours	0 millis	8 millis	
performance monitor	0.200 exec/sec	1,451	5 sec	4.7 millis	8 millis	
gatewayareanetworkconnectionmanager						
connection monitor	0.200 exec/sec	1,453	5 sec	0.1 millis	0 millis	
gatewaysystemtags						
basictags	0.999 exec/sec	7,274	1 sec	0 millis	0 millis	

Related Topics ...

- [Diagnostics - Logs](#)

# Diagnostics - Logs

One of the most important troubleshooting tools of the [Gateway Webpage](#) is the Logs page. This console shows errors caused by [Gateway](#) events including things like Database or Device connections, Authentication profiles, Alarm Journals and Pipelines, and anything else that is [Gateway](#) scoped. You can find logs in the Status tab of the [Gateway Webpage](#) under **Diagnostics > Logs**.



## On this page ...

- [Changing Logging Levels](#)
- [Downloading the Logs](#)
- [Printing to the Logs](#)
- [Mapped Diagnostic Context Keys](#)

The [Gateway](#) Logs also provide a wealth of information about the running state of the [Gateway](#). To learn more, refer to the section on [Troubleshooting the Gateway](#). The Logs page is where the [Gateway](#) Console is located that allows you to see a live flow of log events in the system.

Attributes	Description
Logger	Name of the logger that describes the context of the message.
Time	Time of log.
Message	Message for the log.
Filter	Search criteria to filter for specific tasks or events. Click the <b>Calendar</b> icon to set a filter date and time range. Options are Last Month, Last Week, Last 24 Hours, or Custom.
Min Level	Dropdown menu with options: All, Trace, Debug, Info, Warn and Error.
Live Values	Toggle switch to turn live values on or off.

Status > Diagnostics > Logs			
37978 items < < 1 of 380 > >			
Logger	Time	Message	
I ModuleManager	26Mar2019 10:46:23	Uninstalling module "secsgem"	
I ModuleManager	26Mar2019 10:30:52	Starting up module 'secsgem' (v2.9.10 (b2018112813))...	
W ModuleManager	26Mar2019 10:30:51	Module "SECS/GEM" requires Ignition 7.8.0 (b0) and is not compatible with Ignition 8.0.0-beta0 (b2019032202)	
I ModuleManager	26Mar2019 10:30:51	Installing module: "secsgem"	
I DesignSession	26Mar2019 09:15:58	Socket connected to session. pageld=Test/FirstView	
I DesignSession	26Mar2019 09:15:20	Socket connected to session. pageld=session	
I InternalDatabase	26Mar2019 09:08:07	Created auto-backup of internal database "config.idb" in 1 seconds	
I InternalDatabase	26Mar2019 09:08:06	Creating auto-backup of internal database "config.idb"...	
W LicenseManager	26Mar2019 09:04:20	Could not read license from HASP key. HASP login() failed. Last error = 14. Error executing global timer script: Perspective/Print to Diagnostic Logs @1,000ms . Repeat errors of this type will be logged as 'debug' messages.	
E TimerScriptTask	26Mar2019 09:03:37		
W SubscriptionManager	26Mar2019 09:03:37	[Ignition-ignition8-ubuntu-64bit] Subscription path model set detected to be out of sync. Will re-synchronize.	
I IgnitionGateway	26Mar2019 09:03:36	Ignition[state=STARTING] ContextState = RUNNING	
I IgnitionGateway	26Mar2019 09:03:36	Gateway started in 31 seconds.	

## Changing Logging Levels

The logs can be filtered by using a search term or by date.

1. To change logging levels, go to the Gateway's **Status > Diagnostics > Logs** page and click on the icon.
2. On the Log Configuration popup that will open, search for the logger name in the Filter box, and select the desired logging level from the dropdown to the right of the logger name

## Downloading the Logs

Gateway logs can also be exported using the **Download Logs** icon on the right.

## Printing to the Logs

You can print to Gateway logs by using the `system.util.getLogger()` function. Below is a simple example, you can look in the [appendix](#) for more options.

```
logger = system.util.getLogger("My Logger Name")
logger.warn("My Warning Message")
```

## Mapped Diagnostic Context Keys

Mapped Diagnostic Context Keys (MDC Keys) allow you to specify a specific context, such as a particular project, and then set a logging level for it. This will set all loggers that pertain to the specified project to the logging level. This is useful to help diagnose an issue with a specific system within

the Gateway. To use MDC Keys, click the icon on the Logs page and navigate to the Context tab. Here, you can choose specific Key-Value pairs that match a particular system. Selecting the Key text field will bring up a list of possible keys in your system. Once a Key has been selected, selecting the Value text field will bring up a list of possible values that relate to the selected Key.

## Log Configuration

**Loggers** **Context** X

Key	Value	Set Level	INFO	Add Level
store-forward-name				
connection-name				
project-name				
alarm-notification-profile	MySQL	DEBUG		
device-name				
gw-name				
module-name	Symbol Factory	INFO		
project				
route-path				
session-project				

### Filter by Mapped Diagnostic Context Key

The Logs can also be filtered to show only logs that pertain to an MDC Key. This can be useful when altering the logging level of one or more MDC Keys. To set an MDC filter on the logs, simply click the **Add Mapped Diagnostic Context Filter** icon on the Logs page to open a window where MDC Key filters can be set. The filter can be specified for all values in a Key by not specifying a Value.

## MDC Filter Configuration

X

Key	Value	Add Filter
enter key	enter values	

**Key** **Values** **Action**

No Log Filters Configured

### Merging to Logs

Many of the other pages in the Status tab also contain a logger that will just show logs that are relevant for that particular section. These log views all contain a button on the right side called **Merge to Logs**. This button allows the current filter to be applied to the main logs page, allowing you to still see only the logs for that section but use all of the tools available.

◀ ▶ ⏪ ⏩

Live Values <span style="float: right;">ON</span>	<b>Merge to Logs</b> <span style="color: blue; font-size: small;">[x]</span>
---	--

[Related Topics ...](#)

- [Diagnostics - Execution](#)
- [Diagnostics - Running Scripts](#)
- [Diagnostics - Threads](#)

[In This Section ...](#)

# Diagnostics - Running Scripts

The Running Scripts page shows all actively running Gateway scripts, as well as providing a way to terminate any running script. In addition, the Vision client and Designer consoles have a Running Scripts tab, which also lists running scripts and provides a way to terminate them.

Attributes	Description
Thread Id	Thread Id number.
Description	Name and description of the script.
Execution Start	Time script started running.
Elapsed Time	Amount of time the script has been running.
Actions	Ability to Cancel the running script.

The screenshot shows a web-based interface titled 'Currently Running Scripts'. At the top left is a breadcrumb navigation: 'Status > Diagnostics'. Below the title is a search bar labeled 'Filter' with a placeholder 'type to filter' and a 'View' dropdown set to '20'. A table displays a single row of data:

Thread Id	Description	Execution Start	Elapsed Time	Actions
3188	TimerScript - project:Production GatewayLogger @10,000ms	26Mar2020 10:56:07	24 seconds	<button>Cancel</button>

Pagination controls at the bottom right indicate '1 of 1'.

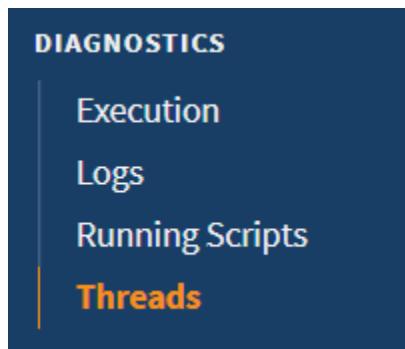
Related Topics ...

- [Diagnostics - Execution](#)
- [Diagnostics - Logs](#)
- [Diagnostics - Running Threads](#)

# Diagnostics - Threads

The Threads page displays a snapshot of information about Gateway's execution threads. This information may be important when troubleshooting certain types of issues. If you are working with Support, you may be asked for a thread dump.

Their state and CPU usages are displayed to easily find problem threads, as well as a chart of what systems are using the threads and the ability to filter the threads based on a keyword. Each thread can be expanded to give details on what it is currently doing, and that individual thread process can be copied to the clipboard.



## On this page ...

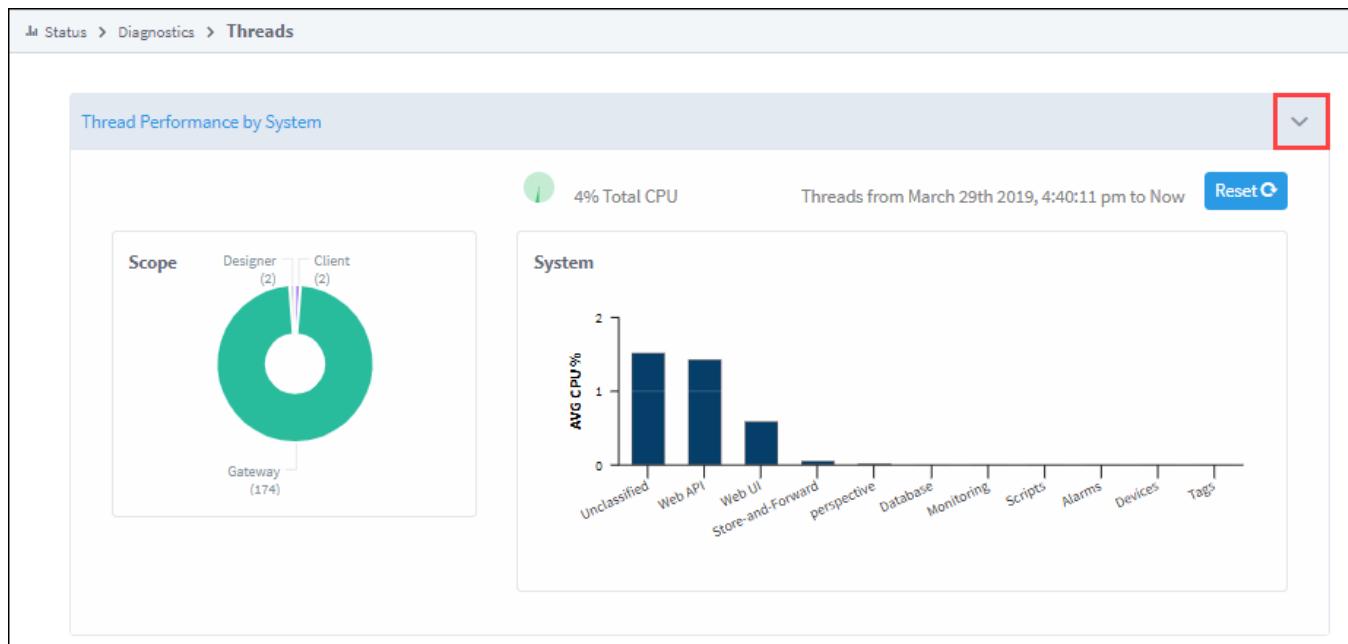
- [Thread Performance by System](#)
- [Individual Threads](#)

## Thread Performance by System

The upper section of the Diagnostics - Threads page depicts graphical representation of the current threads including percentage of total CPU used, overall scope, and average CPU usage per system.

Click the **Expand** icon to see the display.

Click the **Reset** icon to reset the information.

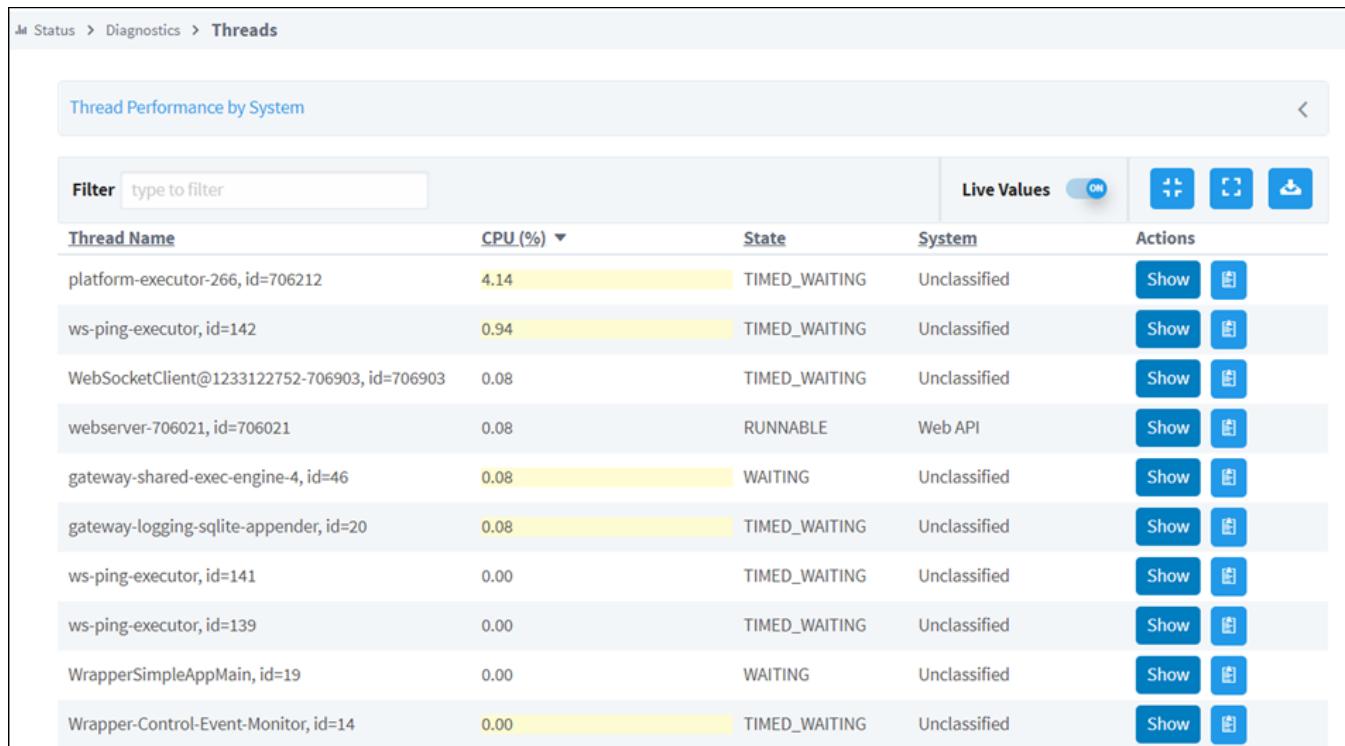


## Individual Threads

The lower portion of the Diagnostics - Threads page displays statistics for individual threads.

To download a thread dump, click the **Download**  icon on the right of the page. In order to be useful, a thread dump must be taken at the time the issue is observed. Unlike logs, which maintain a record of past messages, a thread dump is a time-specific snapshot and will not contain a record of past states.

Attributes	Description
Thread Name	Name of the thread.
Filter	Search criteria to filter for specific threads.
CPU(%)	Percentage of CPU usage.
State	Current state / status of the system.
System	Search criteria to filter for specific tasks or events.
Actions	View thread details.
Live Values	Toggle switch to turn live values on or off.



Thread Name	CPU (%)	State	System	Actions
platform-executor-266, id=706212	4.14	TIMED_WAITING	Unclassified	Show  
ws-ping-executor, id=142	0.94	TIMED_WAITING	Unclassified	Show  
WebSocketClient@1233122752-706903, id=706903	0.08	TIMED_WAITING	Unclassified	Show  
webserver-706021, id=706021	0.08	RUNNABLE	Web API	Show  
gateway-shared-exec-engine-4, id=46	0.08	WAITING	Unclassified	Show  
gateway-logging-sqlite-append, id=20	0.08	TIMED_WAITING	Unclassified	Show  
ws-ping-executor, id=141	0.00	TIMED_WAITING	Unclassified	Show  
ws-ping-executor, id=139	0.00	TIMED_WAITING	Unclassified	Show  
WrapperSimpleAppMain, id=19	0.00	WAITING	Unclassified	Show  
Wrapper-Control-Event-Monitor, id=14	0.00	TIMED_WAITING	Unclassified	Show  

Click the **Show**  icon to display additional details for a single thread. You can click the **Clipboard**  icon to copy that thread to the clipboard.

Status > Diagnostics > Threads

### Thread Performance by System

Thread Name	CPU (%)	State	System	Actions
platform-executor-267, id=706857	5.15	TIMED_WAITING	Unclassified	<button>Hide</button> <button>Copy</button>
Thread [platform-executor-267] id=706857, (TIMED_WAITING for java.util.concurrent.SynchronousQueue\$TransferStack@7a8acf5) java.base@11.0.6/jdk.internal.misc.Unsafe.park(Native Method) java.base@11.0.6/java.util.concurrent.locks.LockSupport.parkNanos(Unknown Source) java.base@11.0.6/java.util.concurrent.SynchronousQueue\$TransferStack.awaitFill(Unknown Source) java.base@11.0.6/java.util.concurrent.SynchronousQueue\$TransferStack.transfer(Unknown Source) java.base@11.0.6/java.util.concurrent.SynchronousQueue.poll(Unknown Source) java.base@11.0.6/java.util.concurrent.ThreadPoolExecutor.getTask(Unknown Source) java.base@11.0.6/java.util.concurrent.ThreadPoolExecutor.runWorker(Unknown Source) java.base@11.0.6/java.util.concurrent.ThreadPoolExecutor\$Worker.run(Unknown Source) java.base@11.0.6/java.lang.Thread.run(Unknown Source)				
ws-ping-executor, id=142	0.94	TIMED_WAITING	Unclassified	<button>Show</button> <button>Copy</button>

#### Related Topics ...

- [Diagnostics - Execution](#)
- [Diagnostics - Logs](#)
- [Diagnostics - Running Scripts](#)

# Config

## Gateway Configuration

The Config tab provides access to configuration options for [Gateway settings](#). This is where most of the settings that affect the whole Gateway are set up. We can add database and device connections, users and roles, adjust alarm settings, set up security, create a schedule for a Gateway backup to be taken automatically at specific times, and much more.

The list of Config options on the left menu change based on what modules are installed on your Gateway. Third-party modules have settings that are not discussed on this page.

Once you have the [Gateway](#) up and running, you start by configuring some or all of the general services in Ignition. You make the configuration changes from the [Config](#) section of the Gateway Webpage. The different broad categories of what you can configure are as follows:

- [System](#) (Overview, Backup/Restore, Licensing, Modules, Projects, Redundancy and Gateway Settings)
- [Networking](#) (Web Server, Gateway Network and Email Settings)
- [Security](#) (Auditing ,Users, Roles, Service Security, Identity Providers, Security Levels, and Security Zones)
- [Databases](#) (Connections, Drivers, and Store and Forward)
- [Alarming](#) (General, Journal, Notification, On-Call Rosters, and Schedules)
- [Tags](#) (History and Realtime)
- [OPC Client](#) (OPC Connections and OPC Quick Client)
- [OPC UA](#) (Device Connections, Security, and Server Settings)
- [Enterprise Administration](#) (Event Thresholds, Controller Settings, Agent Management, License Management, and Agent Tasks)
- [Sequential Function Charts](#) (Settings)

Depending on what modules you have installed, some categories may be missing.

## On this page ...

- [Gateway Configuration](#)
- [System](#)
- [Networking](#)
- [Security](#)
- [Databases](#)
- [Alarming](#)
- [Tags](#)
- [OPC Client](#)
- [OPC UA](#)
- [Enterprise Administration](#)
- [Sequential Function Charts](#)

## System

The System section is a sort of catch all section that can do a lot of different things. The first window is the Overview page, which is what will first show up when navigating to the Configure tab. The Overview page only has links to other sections of the Config tab, but it is useful if you aren't exactly sure where the setting you are looking for is located, because the Overview page lists the most common configuration changes.

Page	Description
Backup /Restore	The <a href="#">Backup/Restore</a> page is where you can manually take a backup, and restore a previous backup. It also can upgrade a legacy backup.
Ignition Exchange	On the <a href="#">Ignition Exchange</a> page you can access the Ignition Exchange to browse for resources. You can also import an Ignition Exchange Package that you've downloaded.
Licensing	The <a href="#">Licensing</a> page allows you to control any and all licenses currently activated on the Gateway. It will show all the modules that the license is currently good for, and have some options for activating a new or additional license.
Modules	The <a href="#">Modules</a> page displays all currently installed modules and if they are active or not. This is where you can install a new module or upgrade an existing module.
Projects	The <a href="#">Projects</a> page can easily manage all of the projects currently configured in the Gateway, with settings that change the Name and Title, or the default database and authentication profile of the project.

Redundancy	The <a href="#">Redundancy</a> page is where all of Ignition's redundancy settings are configured. This is where the master and backup nodes are configured as well as the network settings to make sure the two nodes can properly communicate.
Gateway Settings	The <a href="#">Gateway Settings</a> page is where settings are located for the system name, homepage redirect URL, launch settings, scheduled backups, error reporting and other miscellaneous.

## Networking

The Networking section deals with setup and management of the [Gateway Network](#).

Page	Description
Web Server	The Web Server page is for configuring the http and https ports, setting up the SSL / TLS certificate, redirecting traffic through a known address, and whether or not all http traffic should be forcefully redirecting to https. If you are allowing users to access your Gateway from outside your network (through the internet), you will need to configure the Public HTTP Address settings.  You can find out more about SSL in <a href="#">Secure Communication (SSL / TLS)</a> .
Gateway Network	The Gateway Network allows you to connect multiple Gateways together over a wide area network. The Gateway's connection settings can also be changed to only allow certain connections. The <a href="#">Gateway Settings</a> set the basic rules for the system.
Email Settings	The <a href="#">Email Settings</a> section allows you to create an SMTP server connection in the Gateway that can be used by several different resources such as Alarm Notification and Report Schedules.

## Security

Ignition provides several [Security](#) options to safeguard data and applications in Ignition which fall into the following categories, and are set up in the Config section.

Page	Description
General	<p>This feature is new in Ignition version <b>8.1.0</b>  <a href="#">Click here</a> to check out the other new features</p> <p>The <a href="#">Gateway General Security Settings</a> page is new for 8.1.0. It determines <a href="#">security</a> permissions for the <a href="#">Gateway</a> and <a href="#">Designer</a>. For more information, see <a href="#">Security</a>.</p>
Auditing	Here you can set up an <a href="#">Audit Profile</a> to record details about specific events that occurred.
Users and Roles	This is where you set up <a href="#">users and roles</a> . Security policies are defined in terms of the roles set up in the system.
Service Security	A security policy can be defined for each Security Zone and is set up in <a href="#">Service Security</a> . The Security Policy has four sections: Alarm Notification, Alarm Status, History Provider Access, and Tag Access. They work together to define how the local Gateway gives access to incoming Gateway connections.
Identity Providers	<a href="#">Identity Providers</a> (IdP) provide a way for users to log in to Ignition using credentials stored outside of Ignition. An IdP creates, maintains, and manages identity (login) information while providing authentication services to Ignition. This provides a secure login that allows Ignition to use SSL and two-factor authentication (2FA).
Security Levels	<a href="#">Security Levels</a> define a hierarchy for access inside a Perspective Session or Vision Client using IdP authentication. This authorization system provides a way to map roles from an Identity Provider (IdP) to Ignition roles.
Security Zones	A Security Zone is a list of Gateways, Computers, or IP addresses that are defined and grouped together. This group now becomes a zone on the <a href="#">Gateway Network</a> , which can have additional policies and restrictions placed on it. Security Zones provide this functionality to the Gateway Network, limiting locations instead of people to be read-only for specific actions. This allows for greater control over the type of information that is passing over the network, improving security and helping to keep different areas of the business separate, while still allowing them to interconnect.

## Databases

The Databases section is where [database connections](#) are set up. Databases are used in historical data logging, reporting, storing alarm logs, and Tag storage.

Page	Description
Connections	Many of the advanced features of Ignition, such as the Transaction Groups and Tags Historian require a connection to an external database, and most databases require special permissions for each computer that wants to connect. Ignition takes care of all of this. You create a connection to your database once, and every system in Ignition will use that central connection. From here, you can create new <a href="#">database connections</a> and edit existing connections.
Drivers	JDBC drivers used in database connections are imported and configured in <a href="#">Drivers</a> of the Database section.
Store and Forward	The <a href="#">Store-and-Forward</a> system provides a reliable way for Ignition to store data to the database. The Store-and-Forward system settings offer a good deal of flexibility in tuning. Different types of situations and goals will likely require different configurations.

## Alarming

The Alarming section provides general [alarm configuration](#) settings to provide up-to-date status of alarms, store alarm history, build the logic for how, why, and when alarm notifications are delivered, manage alarm notifications for user groups, and send Email, SMS, or Voice notifications. With all these features and functions in Alarming, you can easily create alarms, and design and manage your alarm notifications any way you choose.

Page	Description
General	This General setting provides of some basic alarm configuration settings.
Journal	<a href="#">Alarm Journals</a> are configured in the Alarming section to store basic historical information in a database about alarms that occurred, such as their source and timestamp, associated data on the alarm, and the values of the alarm's properties at the time the event occurred.
Notification	<a href="#">Notification Profiles</a> are configured in the Alarming section to allow for <a href="#">Email</a> , <a href="#">SMS</a> , or <a href="#">Voice</a> notifications to be sent out when an alarm event occurs.
On-Call Rosters	The <a href="#">On-Call Roster</a> is where you create user groups to be notified when an alarm occurs. When an alarm is triggered, it is sent to a designated On-Call Roster where it evaluates the users schedules, and only notifies those users that have an active schedule. Users that are off-schedule will not be notified.
Schedules	Defines the times of users on-call availability and unavailability by configuring <a href="#">Schedules</a> .

## Tags

The Tags section is where both [Realtime Tag Providers](#) as well as [Historical Tag Providers](#) are configured. Note that this is not where individual Tags are set up.

Page	Description
History	Configure the settings for each of the configured <a href="#">Historical Tag Providers</a> , or create new remote or split providers.
Realtime	Configure the settings for each of the configured <a href="#">Realtime Tag Providers</a> , or create new standard or remote providers.

## OPC Client

The OPC Client section is where connections from Ignition's internal OPC UA server to other OPC servers are located.

Page	Description
OPC Connections	Configure <a href="#">OPC Connections</a> to Ignition's built in OPC Server.
OPC Quick Client	The OPC Quick Client allows for quick and simple testing of any OPC Connections connected to the OPC server.

## OPC UA

The OPC UA Server is where Ignition's internal OPC UA server is configured.

Page	Descriptions
Device Connections	This is where all <a href="#">device connections</a> to our internal OPC UA server are configured.
Security	Upload and trust client and server <a href="#">OPC UA certificates</a> .
Server Settings	Configure Ignition's internal <a href="#">OPC UA Server</a> 's settings.

## Enterprise Administration

The [Enterprise Administration](#) section controls the majority of [EAM functions](#). Setting the Gateway to be a Controller or Agent as well as creating Agent Tasks and managing the various Agents from the Controller Gateway can all be done in this section.

### Sequential Function Charts

A [Sequential Function Chart \(SFC\)](#) is a series of scripts that are defined in a single location and then called in sequential order.

Page	Description
Settings	This is where the <a href="#">SFC Settings</a> are configured.

Related Topics ...

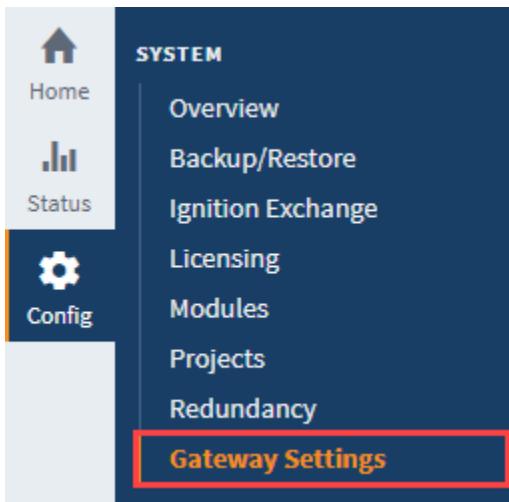
- [Gateway Settings](#)
- [Security](#)
- [Database Connections](#)
- [Tags](#)
- [Alarming](#)
- [OPC UA](#)
- [Enterprise Administration](#)
- [Sequential Function Charts](#)

In This Section ...

# Gateway Settings

## Gateway Settings Property Reference

After you [launch the Gateway](#), you can define the high-level settings that apply to the entire Gateway by going to the **Config > Gateway Settings** on the Gateway Webpage. From this page, you can use the default values or define a new setting. The Gateway is at the heart of the Ignition software. It runs as a web server and you can access it through a web browser. Once running, you can get various status information about the Gateway and access important functions.



### On this page ...

- [Gateway Settings Property Reference](#)
  - [Local Client Fallback Settings](#)
  - [Scheduled Backups](#)
  - [Error Reporting](#)
  - [Multicast Settings](#)

This feature is new in Ignition version **8.1.0**  
[Click here](#) to check out the other new features

The Gateway Settings Properties were updated significantly for release 8.1.0. Many security related settings have been moved to [Gateway General Security Settings](#).

The following tables describe all the properties on the Gateway Settings.

Gateway Settings	
System Name	Is a unique name for this Ignition installation. It is used to distinguish this server from others on the network when working with multiple Ignition installations.
Persist Alarms	Whether or not alarm properties such as acknowledgment should persist across Gateway restarts.
Homepage Redirect URL	The URL this gateway will redirect to when <a href="http://ip:port/">http://ip:port/</a> is visited. Can either be a relative path (e.g., /web/home), or fully qualified (e.g., <a href="https://inductiveautomation.com">https://inductiveautomation.com</a> ).
Gateway Scripting Project	The <a href="#">Gateway Scripting Project</a> is a Project in which Gateway-scoped scripts with no project affiliation can access user script libraries.

Launch Settings	
Designer Memory	The maximum amount of memory that the Designer has access to.
Disable Direct3D	Disables the Direct3D rendering pipeline launched clients. Direct3D can cause performance problems with XOR painting. (affects clients on Windows only)
Disable DirectDraw	Disables the DirectDraw system for launched clients. Can be useful for some video cards that don't support DirectDraw well. (affects clients on Windows only)

## Local Client Fallback Settings

Ignition provides a [Local Vision Client](#) Fallback mechanism that lets you use a Gateway running on the local machine. If the Gateway is lost, the Client can automatically retarget to a project that you specify in the local in the local Gateway.

Local Vision Client Fallback	
Enable Local Fallback	Enables a client to fall back to a project in a local Gateway if communication is lost to the central Gateway. Note that port 6501 must be open on the local machine.
Seconds Before Failover	The number of seconds to wait before switching to the local Gateway project after communication loss.
Fallback Project	The local project to use during fallback.

## Scheduled Backups

The Scheduled Backup Settings control the Gateway's scheduled backup system. This system is capable of automatically making a Gateway backup and storing it to a folder path, which can be a network path. When you enable this system, you must specify a destination folder. This can be a local folder, for example C:\backups or /var/backups , or a network path such as \\fileserver\backups.

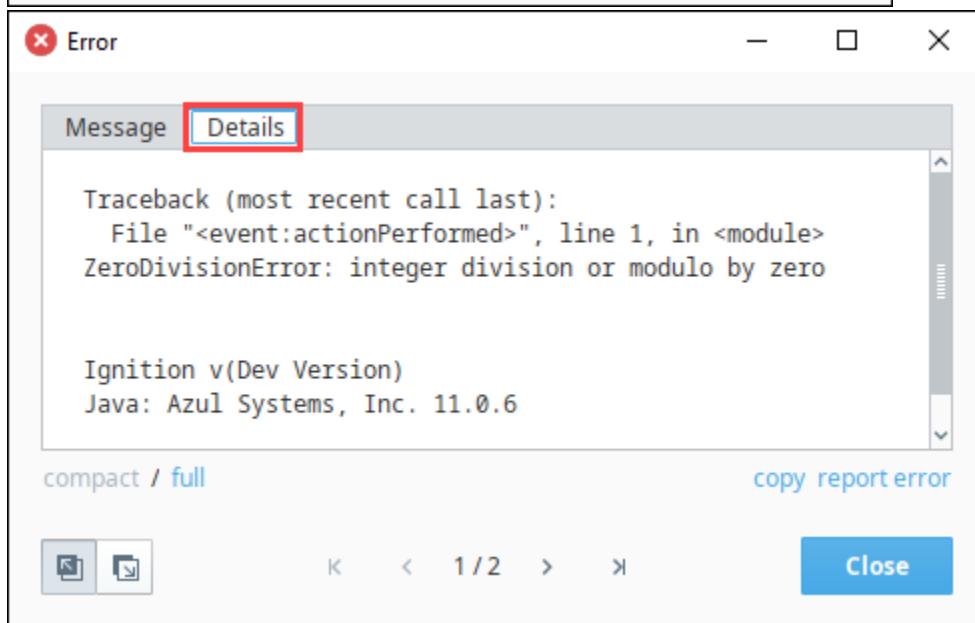
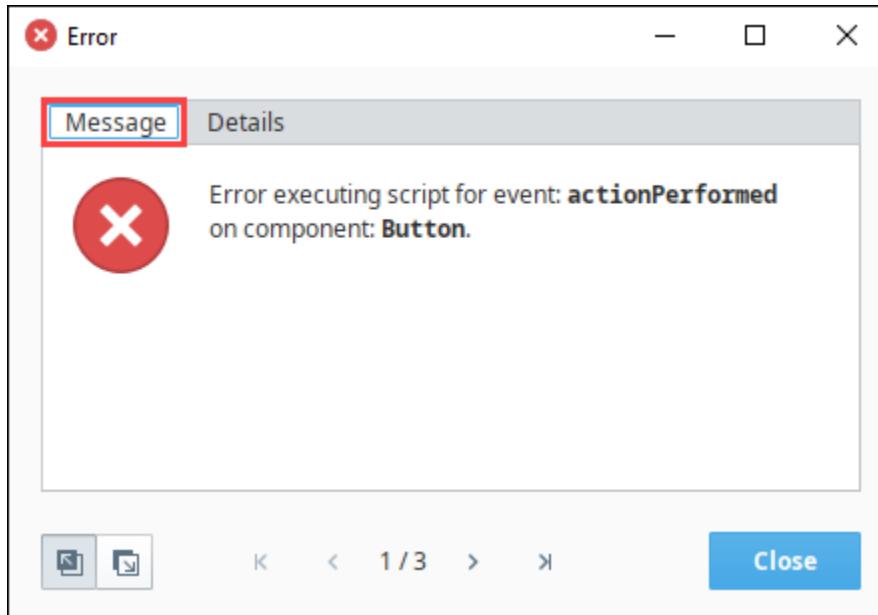
The scheduled backup system works on a schedule that is specified using UNIX Crontab syntax. This is a standard format for specifying a basic schedule. The format consists of five space-separated fields, one for minute, hour, day-of-month, month, and day-of-week. The special Gateway Configuration 72 character \* means all. Slashes can be used to indicate that values should be stepped, for example, \*/5 in the minutes field means "every 5 minutes", or 0:00, 0:05, 0:10, etc.

To learn more on how to schedule Gateway Backups, refer the page on [Gateway Scheduled Backups](#).

Scheduled Backup Settings	
Enable Scheduled Backups	Enables the scheduled backup system which automatically makes backups at a scheduled time.
Backup Folder	A path to a folder in which to put the scheduled backups.
Backup Schedule	A UNIX 'crontab' format scheduling string representing when to make the backups.
Retention Count	The number of backups to keep in the backup folder.

## Error Reporting

When an error occurs in the Client or Designer, the users can click a link on the Details tab to report the error via email.



These settings define how the errors are reported.

Error Reporting	
SMTP Server	When not blank, user-reported errors are emailed using this SMTP server.
To Address	The email address(es) that will receive the error notification. Separate multiple email addresses with a semicolon (;)
From Address	The email address that the error notification is from.
SMTP Username	A username for the SMTP server, if required.
Change Password?	Check this box to change the existing password.
Password	A password for the SMTP server, if required.
Password	Re-type password for verification.

## Multicast Settings

These properties allow the Gateway to broadcast information about itself via multicast UDP packets. This allows the Gateway to be discoverable by any components that are also listening to the same multicast address. For example, native client launchers listen on a multicast address to provide a list of available Gateways on the network. Verify that the send ports and receive ports are open on the Gateway machine in order to be able to broadcast multicast message.

Multicast Settings	
Enable Multicast	Allows this Gateway to be discoverable on your local network.
Multicast IP Address	Gateway messages are broadcast on this address.
Send Port	This port must be open on this machine to send multicast messages.
Receive Port	This port must be open on any machine that will receive multicast messages.
Message Interval	The interval in milliseconds at which multicast messages will be sent.

#### Related Topics ...

- [Config](#)
- [Status](#)
- [Gateway Security](#)
- [Gateway Command-line Utility - gwcmd](#)

# Email Settings

## Gateway-Wide SMTP Server

In Ignition, there are several places that you might want to send an email from. Instead of setting up a new email server connection at each one, you can add SMTP server connections in the Gateway Config section and reference them in other places. For example, you can use a pre-configured connection in any of these places:

- [Alarm Notification](#) - While the alarm notification system allows you to set up an Email Notification Profile that is separate from the SMTP Profile, you can instead choose to use the settings configured in the SMTP Profile.
- [Report Schedules](#) - When Scheduling an Email Action in a report, the Action requires a configured SMTP Profile before the report can be emailed out.
- [system.net.sendEmail\(\)](#) - Instead of manually entering in values for the SMTP server inside each of your scripts, this function can instead use the settings from an existing SMTP Profile.

Once your SMTP Profile is set up, you only need to reference the name of the connection and Ignition will take care of the rest.

## Setting Up an SMTP Server

The Email Settings page allows you to configure an SMTP server connection that can be used by several different resources in the Gateway. This means that instead of setting up an SMTP server connection within each resource (i.e., Alarm Notification Profile, Reports, etc.), you can configure them once here, and have those resources all use the same SMTP server. You can find the Email Settings in the **Config** section of the [Gateway](#) under the Networking heading. Here, you can create a new SMTP Profile, or manage your existing profiles.

The screenshot shows the Ignition Config interface. The left sidebar has a 'Config' tab selected. Under 'SYSTEM', 'Email Settings' is highlighted with a red box. Under 'NETWORKING', 'Email Settings' is also highlighted with a red box. The main content area shows the 'SMTP Profiles' configuration page. It has a table with one row for 'Ignition'. Below the table is a link to 'Create new SMTP Profile...'.

## SMTP Profile Settings

Below is a list of properties available on an SMTP server connection.

Property Name	Property Description
Name	The name of the SMTP profile.
Description	A description of the SMTP profile.

## On this page ...

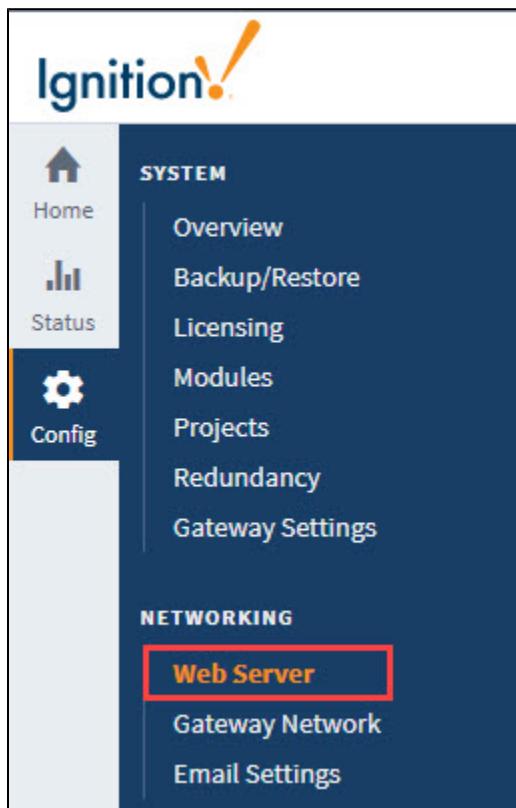
- [Gateway-Wide SMTP Server](#)
  - [Setting Up an SMTP Server](#)
  - [SMTP Profile Settings](#)

Hostname	Hostname of the SMTP server to send email through.
Port	Port SMTP service is running on. Default is 25.
Use SSL/TLS	Connect using dedicated SSL/TLS. Default is false.
Use STARTTLS	Enable use of the STARTTLS command, allowing the connection to be upgraded to an SSL or TLS connection if supported by the server. This is not necessary for connections that are already SSL/TLS. Ignored when Use SMTP Profile is checked. Default is false.
Username	The username the Gateway will use when authenticating against the mailserver. This is only required if the SMTP server expects authentication.
Password	The password the Gateway will use when authenticating against the mailserver. This is only required if the SMTP server expects authentication.
Password	Retype password for verification.
Advanced Properties	
SMTP Timeout	Timeout (in milliseconds) to use when connecting to, reading from, and writing to the SMTP server. Default is 10,000.
Debug Mode Enabled	Enable email session debugging. Information is printed to standard output (wrapper.log). Default is false.
SSL Protocols	A comma separated list of protocols that will be allowed if connecting via SSL/TLS. Default is TLSv1.2.

# Web Server Settings

The Web Server page is for configuring the HTTP and HTTPS ports, setting up the SSL / TLS certificate, redirecting traffic through a known address, and whether or not all HTTP traffic should be forcefully redirecting to HTTPS.

If you are allowing users to access your Gateway from outside your network (through the Internet), you will need to configure the Public HTTP Address settings.



## On this page ...

- SSL/TLS Settings
  - HTTP and HTTPS Settings
  - HTTP and HTTPS Connectors Restart
  - Public HTTP Address settings
  - Cipher Support

## SSL/TLS Settings

On the Web Server screen you can view details of an SSL certificate details, export keys, remove the installed SSL certificate, and transition to a CA-signed certificate.

From the Gateway Webpage, click on **Config > Networking > Web Server**. From the Web Server page, click on the **View Details** button.



#### SSL / TLS ENABLED

CA-Signed SSL Certificate installed.

### SSL / TLS

SSL / TLS  
Certificate

[View Details](#)

View the certificate details, export keys, remove the installed SSL certificate, and transition to a CA-signed Certificate

### HTTP Settings

HTTP Port

8088

The port to which Ignition will listen for incoming HTTP traffic. *Example: 8088*

### HTTPS Settings

The Certificate Details are shown. From here you can generate a Certificate Signing Request (CSR) by clicking the Generate CSR button in the upper right.



SSL / TLS ENABLED

CA-Signed SSL Certificate installed.

## Active SSL Certificate

[Generate CSR](#)[Delete](#)

<b>Subject</b>	
<b>Country</b>	US
<b>State/Province</b>	California
<b>Locality</b>	Folsom
<b>Organization</b>	Inductive Automation
<b>Common Name</b>	inductiveautomation.com
 <b>Issuer</b>	
<b>Country</b>	US
<b>State/Province</b>	California
<b>Locality</b>	Folsom
<b>Organization</b>	Inductive Automation
<b>Common Name</b>	Ignition Test Intermediate Certificate Authority
 <b>Version</b>	3
<b>Signature Algorithm</b>	SHA256withRSA
<b>Not Valid After</b>	Wed Oct 23 2019 08:47:17 GMT-0700
	<span style="color: orange;">⚠ Expires Soon</span>
<b>Not Valid Before</b>	Mon Jul 15 2019 08:47:17 GMT-0700

[→ Upload Trusted CA-signed SSL Certificate...](#)[→ Return to Web Server...](#)

For more information, see [Secure Communication \(SSL / TLS\)](#).

## HTTP and HTTPS Settings

HTTP Settings	
HTTP Port	The port to which Ignition will listen for incoming HTTP traffic, for example: 8088.
HTTPS Settings	
HTTPS Port	The port to which Ignition will listen for incoming HTTPS traffic, for example: 8043.
Force Secure Redirect	When enabled, and if SSL / TLS is enabled, all http traffic will be redirected to its https counterpart. (Default: disabled)
Included Cipher Suites	Whitelist of included cipher suites for clients connecting to Ignition using SSL/TLS.
Excluded Cipher	Blacklist of excluded cipher suites for clients connecting to Ignition using SSL/TLS. Takes precedence over allowed cipher

## HTTP and HTTPS Connectors Restart

Certain actions will cause the HTTP port and/or the HTTPS port to restart. Refer to the following table for details.

Configuration Change	HTTP Port Restarted?	HTTPS Port Restarted?
HTTPS Port	Yes	Yes
HTTPS Port	Yes	Yes
Force Secure Redirect	No	Yes
User Included Cipher Suites	No	Yes
User Excluded Cipher Suites	No	Yes
SSL/TLS Setup	No	Yes

## Public HTTP Address settings

If you are allowing users to access your Gateway from outside your network (through the Internet), you will need to configure the Public HTTP Address settings.

Public HTTP Address	
Auto Detect HTTP Address	To specify an explicit HTTP address that Vision Clients and Perspective Sessions will use, turn this off. Most users will leave autodetect on. (Default: enabled)
Public Address	The public facing address that Vision Clients and Perspective Sessions must use to connect. If Force Secure Redirect is enabled, redirected connections will use this address, for example: <a href="http://yourcompany.com">yourcompany.com</a> .
Public HTTP Port	The public facing HTTP port that Vision Clients and Perspective Sessions must use to connect, for example: 80
Public HTTPS Port	The public facing HTTPS port that Vision Clients and Perspective Sessions must use to connect. If Force Secure Redirect is enabled, redirected connections will use this port, for example: 443

## Cipher Support

Below is a list of supported ciphers.

- TLS\_AES\_128\_GCM\_SHA256
- TLS\_AES\_256\_GCM\_SHA384
- TLS\_CHACHA20\_POLY1305\_SHA256
- TLS\_DHE\_DSS\_WITH\_AES\_128\_CBC\_SHA
- TLS\_DHE\_DSS\_WITH\_AES\_128\_CBC\_SHA256
- TLS\_DHE\_DSS\_WITH\_AES\_128\_GCM\_SHA256
- TLS\_DHE\_DSS\_WITH\_AES\_256\_CBC\_SHA
- TLS\_DHE\_DSS\_WITH\_AES\_256\_CBC\_SHA256
- TLS\_DHE\_DSS\_WITH\_AES\_256\_GCM\_SHA384
- TLS\_DHE\_RSA\_WITH\_AES\_128\_CBC\_SHA
- TLS\_DHE\_RSA\_WITH\_AES\_128\_CBC\_SHA256
- TLS\_DHE\_RSA\_WITH\_AES\_128\_GCM\_SHA256
- TLS\_DHE\_RSA\_WITH\_AES\_256\_CBC\_SHA
- TLS\_DHE\_RSA\_WITH\_AES\_256\_CBC\_SHA256
- TLS\_DHE\_RSA\_WITH\_AES\_256\_GCM\_SHA384
- TLS\_DHE\_RSA\_WITH\_CHACHA20\_POLY1305\_SHA256
- TLS\_ECDHE\_ECDSA\_WITH\_AES\_128\_CBC\_SHA
- TLS\_ECDHE\_ECDSA\_WITH\_AES\_128\_CBC\_SHA256
- TLS\_ECDHE\_ECDSA\_WITH\_AES\_128\_GCM\_SHA256
- TLS\_ECDHE\_ECDSA\_WITH\_AES\_256\_CBC\_SHA
- TLS\_ECDHE\_ECDSA\_WITH\_AES\_256\_CBC\_SHA384
- TLS\_ECDHE\_ECDSA\_WITH\_AES\_256\_GCM\_SHA384
- TLS\_ECDHE\_ECDSA\_WITH\_CHACHA20\_POLY1305\_SHA256
- TLS\_ECDHE\_RSA\_WITH\_AES\_128\_CBC\_SHA
- TLS\_ECDHE\_RSA\_WITH\_AES\_128\_CBC\_SHA256
- TLS\_ECDHE\_RSA\_WITH\_AES\_128\_GCM\_SHA256
- TLS\_ECDHE\_RSA\_WITH\_AES\_256\_CBC\_SHA
- TLS\_ECDHE\_RSA\_WITH\_AES\_256\_CBC\_SHA384
- TLS\_ECDHE\_RSA\_WITH\_AES\_256\_GCM\_SHA384

- TLS\_ECDHE\_RSA\_WITH\_CHACHA20\_POLY1305\_SHA256
- TLS\_ECDH\_ECDSA\_WITH\_AES\_128\_CBC\_SHA
- TLS\_ECDH\_ECDSA\_WITH\_AES\_128\_CBC\_SHA256
- TLS\_ECDH\_ECDSA\_WITH\_AES\_128\_GCM\_SHA256
- TLS\_ECDH\_ECDSA\_WITH\_AES\_256\_CBC\_SHA
- TLS\_ECDH\_ECDSA\_WITH\_AES\_256\_CBC\_SHA384
- TLS\_ECDH\_ECDSA\_WITH\_AES\_256\_GCM\_SHA384
- TLS\_ECDH\_RSA\_WITH\_AES\_128\_CBC\_SHA
- TLS\_ECDH\_RSA\_WITH\_AES\_128\_CBC\_SHA256
- TLS\_ECDH\_RSA\_WITH\_AES\_128\_GCM\_SHA256
- TLS\_ECDH\_RSA\_WITH\_AES\_256\_CBC\_SHA
- TLS\_ECDH\_RSA\_WITH\_AES\_256\_CBC\_SHA384
- TLS\_ECDH\_RSA\_WITH\_AES\_256\_GCM\_SHA384
- TLS\_EMPTY\_RENEGOTIATION\_INFO\_SCSV
- TLS\_RSA\_WITH\_AES\_128\_CBC\_SHA
- TLS\_RSA\_WITH\_AES\_128\_CBC\_SHA256
- TLS\_RSA\_WITH\_AES\_128\_GCM\_SHA256
- TLS\_RSA\_WITH\_AES\_256\_CBC\_SHA
- TLS\_RSA\_WITH\_AES\_256\_CBC\_SHA256
- TLS\_RSA\_WITH\_AES\_256\_GCM\_SHA384

In This Section ...

# Secure Communication (SSL / TLS)

Inductive Automation recommends enforcing secure communication in Ignition using digital certificates. The Ignition Gateway Web server can provide modern end-to-end security using Transport Level Security (TLS) technologies. This protects externally-originated connections such as: Perspective sessions, Vision clients, Designers, and Ignition web configuration. Users should be familiar with the browser padlock icon (secure session) from online banking, shopping, or medical portals. TLS assures users of the distant end identity and offers protection from attackers and eavesdroppers through strong encryption. This configuration is different from Gateway-originated outbound communication such as database and device (OPC UA) connections, alarming, and web services (REST) calls, which are secured separately and have configuration that depends on distant nodes.

Ignition versions 8.0.4 and later default to TLS versions 1.2 and 1.3 with a valid certificate. Older versions of Ignition should be upgraded to offer protection against known vulnerabilities. Refer to the [Ignition Security Hardening Guide](#) for configuration recommendations.

## Enabling Force Secure Redirect

Normally, Clients, Sessions, Designers, and Web browsers that communicate with the Gateway will do so over an HTTP. However, you can force these communications to be redirected to the more secure HTTPS.

1. Go to the **Config** section of the Gateway Webpage.
2. Choose **Networking > Web Server** from the menu on the left.
3. Select the checkbox for **Force Secure Redirect**, and click the **Save** button at the bottom of the page.

HTTPS Settings	
HTTPS Port	8043 The port to which Ignition will listen for incoming HTTPS traffic. Example: 8043
Force Secure Redirect	<input checked="" type="checkbox"/> When enabled, and if SSL / TLS is enabled, all http traffic will be redirected to its https counterpart. (Default: disabled)
Included Cipher Suites	<input type="button" value="Add"/> Whitelist of included cipher suites for clients connecting to Ignition using SSL/TLS
Excluded Cipher Suites	<input type="button" value="Add"/> Blacklist of excluded cipher suites for clients connecting to Ignition using SSL/TLS. Takes precedence over allowed cipher suites.

After once enabled, all requests between the host Gateway and any Clients, Sessions, Designers, or web browsers will be redirected to the HTTPS port (by default, port 8043), and thus encrypted. However, you will likely want to install a security certificate signed by a certificate authority.

## Adding a Signed Security Certificates

We are not able to ship a real certificate with Ignition because security certificates have to be obtained individually from a Certificate Authority (CA). Ignition supports certificates from both your organization's internal CA, as well as commercial CAs (Verisign, GoDaddy, Comodo, etc.). In either case, the procedure for how to install a certificate is listed below.

**Note:** After you have added a certificate, the keystore will automatically refresh every 15 minutes. You can disable this in the `ignition.conf` file by altering the `ignition.ssl.refresh` entry (Set to 0 to not refresh).

## Get a Certificate Signing Request

Since SSL/TLS requires the installation of a security certificate, filling out the form below will generate a certificate signing request (CSR) to provide to a certificate authority.

1. Go to the **Config** tab of the Gateway Webpage and choose **Networking > Web Server**.
2. You'll see a warning message indicating that SSL/TLS is not enabled. Click on the **Click here** link.

## On this page ...

- [Enabling Force Secure Redirect](#)

[Adding a Signed Security Certificates](#)

- [Get a Certificate Signing Request](#)
- [Install Security Certificates](#)



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## Requiring SSL

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### SSL / TLS NOT ENABLED

SSL / TLS allows for secure communication with the gateway. In order to be enabled, it requires an SSL certificate to be installed.

[Click here](#) to be guided through the process of installing an SSL certificate in order to enable SSL / TLS.

3. Click on the **I don't have all the items above** button. The Create Certificate screen is displayed.
4. Fill in the required fields on the screen, then click the **Generate Certificate Signing Request** button. This can be brought to a Certificate Authority.

Basic Details	
Field	Definition
Common Name	Full DNS name (required). This is typically what you type in your browser URL bar in order to navigate to this Gateway, for example: yourdomain.com
Organization Name	Name of company (required). For example: Inductive Automation.
Organization Department	Department or section (required). For example: Engineering
Email	Email address. For example: <a href="mailto:your@email.com">your@email.com</a> .
Country	Typically an ISO 3166 2 character code (required). For example: US
State / Province	State, province or region, for example: California
Locality (City)	Name of city. For example: Folsom
Street	Street number and street name. For example: 90 Parkshore Dr
Postal Code	Postal Code Example: 95630
Key Type	The algorithm of the key pair which will be generated for the self signed certificate. Options are RSA or EC. Recommended: RSA
Key Size	The strength of the generated Key. Recommended: 2048 bits
Expires in	The number of days the generated Certificate will be valid. Only applies to the self-signed certificate.
Subject Alternative Names	
Field	Definition
IP Addresses	The IP addresses of all the servers you plan on installing the certificate. Click the <b>Add</b> button for each additional IP address.
DNS Names	DNS names which map to the list of IP addresses above. Click the <b>Add</b> button for each additional IP address.

## Install Security Certificates

Once you have an SSL certificate, it needs to be added to Ignition.

1. Go to the **Config** tab of the Gateway Webpage and choose **Networking > Web Server**.
2. You'll see a warning message indicating that SSL/TLS is not enabled. Click on the [Click here](#) link.
3. The Setup SSL/TLS screen is displayed. Review the following list:
  - Private Key
  - Certificate Signed By A Certificate Authority (CA)
  - Any Intermediate CA Certificates (Provided by your CA)
  - Root CA Certificate (Provided by your CA)
4. If you have the items, click on the **I have all the items above** button. If you don't have all the items, click on the **I don't have all the items above button**, and follow the previous procedure, [Get a Certificate Signing Request](#).

## Setup SSL / TLS

Securing web communications requires the installation of a *SSL Certificate* and requires the following items:

- Private Key
- Certificate Signed By A Certificate Authority (CA)
- Any Intermediate CA Certificates (Provided by your CA)
- Root CA Certificate (Provided by your CA)

Do you currently have all items listed above? If you don't, we can create a certificate signing request (CSR) to provide to a CA for signing and a private key.

I have all the items above

I don't have all the items above

Return

5. The Certificate Wizard is displayed. The first step is to import your private key in one of the following three ways.

- Drag and Drop your certificate from your computer onto the screen.
- Click anywhere on the grey box to browse for the private key.
- Click **Manually enter data** button to type in the private key information

The screenshot shows the 'Certificate Wizard' step 1 interface. At the top, there's a note about uploading private keys over unsecured networks. Below it, a red box highlights the '1) Private Key\*' input field. To its right is a large grey area containing a red-bordered box with a downward arrow icon and the text 'Drag and drop or click to browse' and 'Manually enter data'. At the bottom left is a checkbox for enabling a password, and at the bottom right are 'Cancel' and 'Continue' buttons.

6. If the private key is encrypted, click the **checkbox** to enable a password for this certificate and enter the password in the field. Click **Continue**.  
7. The next step is to import the server certificate. This is the The DER or PEM encoded X.509 SSL Certificate that Ignition will use for SSL / TLS. Drag and drop the certificate file, browse for it, or manually enter the data.

Config > Network > Web Server > Certificate Wizard

**Note:** If you upload your own private key, it will be done over an unsecured network. It is important to understand the risks and mitigations before proceeding. The certificates provided by a CA build a chain of trust. Follow the steps below in order to build this chain of trust.

**1) Private Key\***  
The DER or PEM encoded private key in SSLeay or PKCS#8 format. Provide a password if the private key is encrypted.

Private Key Successfully Uploaded

**2) Server Certificate\***  
The DER or PEM encoded X.509 SSL Certificate that Ignition will use for SSL / TLS.

Drag and drop or click to browse  
Manually enter data

**Cancel** **Continue**

- The next step is to import the certificate chain. This gives you the Intermediate CA Certificate. Drag and drop the certificate file or bundle, browse for it, or manually enter the data.

Config > Network > Web Server > Certificate Wizard

**Note:** If you upload your own private key, it will be done over an unsecured network. It is important to understand the risks and mitigations before proceeding. The certificates provided by a CA build a chain of trust. Follow the steps below in order to build this chain of trust.

**1) Private Key\***  
The DER or PEM encoded private key in SSLeay or PKCS#8 format. Provide a password if the private key is encrypted.

Private Key Successfully Uploaded

**2) Server Certificate\***  
The DER or PEM encoded X.509 SSL Certificate that Ignition will use for SSL / TLS.

Server Certificate Successfully Uploaded

**3) Certificate Chain**  
The DER or PEM encoded X.509 SSL Certificate which issued the previous certificate. If a certificate chain bundle is provided, the first entry must be the issuer of the previous certificate and each certificate which follows must be the issuer of the certificate which precedes it.

Drag and drop or click to browse  
Manually enter data

**Cancel** **Continue**

- Finally, import the root CA certificate: Drag and drop the certificate file, browse for it, or manually enter the data. You'll see a message that the Root CA Certificate was successfully uploaded.

The screenshot shows the 'Certificate Wizard' interface with four completed steps:

- 1) Private Key\***: The DER or PEM encoded private key in SSLeay or PKCS8 format has been successfully uploaded.
- 2) Server Certificate\***: The X.509 SSL Certificate that Ignition will use for SSL / TLS has been successfully uploaded.
- 3) Root CA Certificate**: The X.509 root CA certificate which issued the preceding certificate and itself has been successfully uploaded.
- 4) Root CA Certificate**: The X.509 root CA certificate which issued the preceding certificate and itself has been successfully uploaded.

At the bottom are 'Cancel' and 'Continue' buttons.

- Click the **Continue** button.
- You'll see a confirmation message that the certificate is installed and SSL/TLS is enabled.

The screenshot shows the 'Web Server' configuration page with the following sections:

- SSL / TLS**: Shows 'SSL / TLS ENABLED' and 'CA-Signed SSL Certificate installed.'
- SSL / TLS Certificate**: A 'View Details' button is available to view certificate details, export keys, remove the installed SSL certificate, and transition to a CA-signed Certificate.
- HTTP Settings**: Shows the 'HTTP Port' set to 8088, with a note: 'The port to which Ignition will listen for incoming HTTP traffic. Example: 8088'

- If you have a redundant installation, you'll need to repeat this procedure on your backup server.

Related Topics ...

- Security
- Security in Perspective
- Security in Vision

# Gateway Backup and Restore

## Gateway Backups vs Project Exports

It is a good idea to create backups anytime you make changes to Ignition. There are two main types of backups available in Ignition: Gateway backups and Project exports. You can choose to backup up everything, or be selective about what you want to backup and restore. Ignition is designed to be architecture agnostic or compatible across all platforms. This is particularly helpful when you want to restore your Gateway on a new machine or platform.

Gateway backups are all inclusive and Project exports are simply a backup of individual projects. Whether it is a Gateway backup or Project export, it's always good practice to create backups regularly when making changes to Ignition. This page discusses making Gateway backups and restoring from a Gateway backup. To learn more about project backups and restoring projects, refer to the [Project Export and Import](#) page.

## Gateway Backup and Restore

Creating Gateway backups and restoring from a Gateway backup are super easy in Ignition. Gateway backups are all inclusive, and typically takes less than a minute to run. It includes everything you find in the Ignition Gateway Webpage. Everything gets backed up - all your projects, Gateway settings, authentication profiles, Tags, database connections, OPC and device connections, alarm pipelines, scripts, sequential function charts, reports, and Image Management Library (i.e., png, jpg, and jpeg files). The only data that is not included in a Gateway backup is data stored in other programs such as SQL databases, PLC programs, other files you manually added to the install directory, and any additional files you may be using. This information needs to be backed up separately.

Perspective custom assets such as fonts, icons, and themes are included in a Gateway backup. In addition, any custom assets in a backup file will be restored when performing a Gateway restore.

You have the option of creating a Gateway backup and restoring a backup from the Gateway Webpage or [Gateway Command-line Utility - gwcmd](#). We recommend using Gateway Webpage since it's much easier. Even better, is to set up [scheduled backups](#) to run on a regular schedule.

## On this page ...

- [Gateway Backups vs Project Exports](#)
- [Gateway Backup and Restore](#)
  - [Gateway Backup](#)
  - [Gateway Restore](#)



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## Project Backup vs. Ignition Gateway Backup

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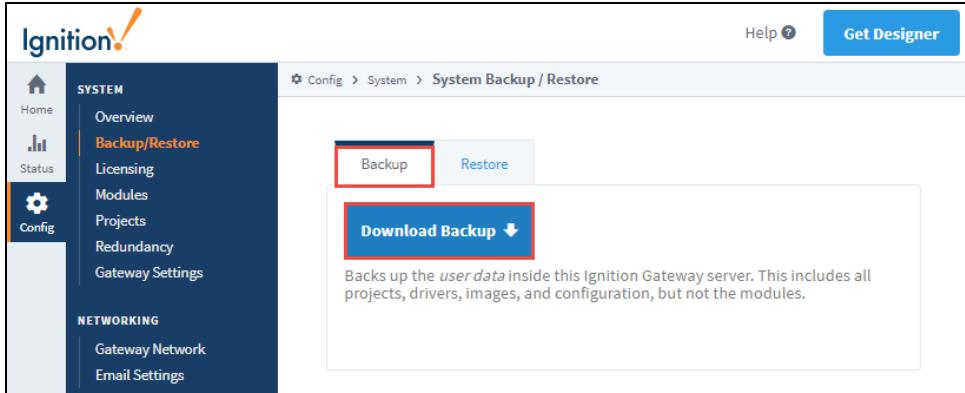
## Making Ignition Gateway Backups

[Watch the Video](#)

## Gateway Backup

The easiest way to create a backup of the Gateway is using the Gateway Webpage.

1. Go to the **Config** tab of the Gateway Webpage, and click on **System > Backup/Restore**.
2. The System Backup/Restore page will be displayed. Make sure the **Backup** tab is selected, then click **Download Backup**.



3. By default, this downloads a **.gwbk** file extension to your local file system in your **Downloads** folder.

**Note:** The Gateway Backup default filename will look like **GatewayName\_Ignition-backup-YYYYMMDD-HHMM.gwbk** where **YYYYMMDD-HHMM** is the timestamp of when it was created.

## Command-line Utility

In Windows and Linux, you can use the command-line utility to create a Gateway backup. To run the Command-line Utility, open a shell and enter the command below.

**Note:** If you want to add a timestamp, you need to enter the date and time in the filename. Refer to the [Command-line Utility](#) page for a complete list of 'gwcmd' options.

```
gwcmd -b C:\Backups\Ignition\IgnitionBackup.gwbk
```

## Gateway Restore

Restoring a Gateway backup is just as easy as backing it up and can also be done from the Gateway Webpage.

**Caution:** When you perform a Gateway Restore, **ALL** of the server's current configuration will be permanently lost! Restoring a Gateway backup overwrites all of the existing settings including your projects. There is no merge option for a Gateway backup. We recommend you always make a backup of the existing server immediately before performing a Gateway Restore.



## Restoring Ignition Gateway Backups

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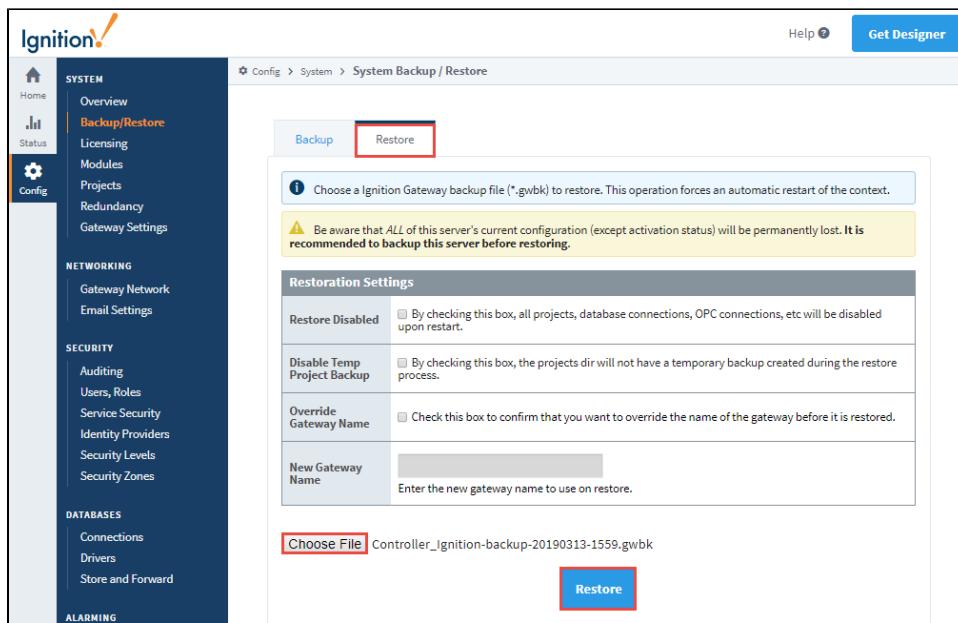
1. Go to the **Config** tab and click on **System > Backup/Restore**.
2. The System Backup/Restore screen will be displayed. Click on the **Restore** tab. Read carefully through the restoration settings, and check the ones you wish to enable.

### Restore Disabled Checkbox

If you check the **Restore Disabled** box, all projects, project resources, notifications, alarm journals, database connections, OPC connections, devices, scripts and third party modules will be disabled upon restart.

3. Click **Choose File**, then navigate to your Gateway backup file (**\*.gwbk**). By default, all your Gateway backup files are saved in your Downloads folder unless you select another folder location to choose an existing Gateway Backup file (**\*.gwbk**) to restore.
4. Choose your Ignition backup file (**.gwbk**), and click **Open**.
5. Click **Restore** at the bottom of the System Backup/Restore screen. The Gateway stops while restoring the backup file. When restoring is complete, the Gateway restarts itself to apply the restored settings. The Gateway Webpage is refreshed and your projects are loaded and

your whole Gateway is restored in less than a minute.



## Command-line Utility

In Windows and Linux, you can use the command-line utility to restore a Gateway backup. To run the Command-line Utility, open a shell and enter the command below. Refer to the [Command-line Utility](#) page for a complete list of '**gwcmd**' options.

```
gwcmd -s C:\Backups\Ignition\IgnitionBackup.gwbk
```

### Related Topics ...

- [Gateway Scheduled Backups](#)
- [Project Export and Import](#)
- [Exporting and Importing Tags](#)

### In This Section ...

# Gateway Scheduled Backups

You never know when a disaster is about to happen, and scheduled backups can get you out of a bad situation. Ignition will automatically create Gateway backups based on whatever schedule you want, and save them wherever you need, even on another server. Just fill in a few settings and Ignition will do the rest.

Once you have regular scheduled backups setup, make sure to secure them too! If you have your IT department regularly save files to an off-site location, it's easy to add these scheduled Gateway backups to the list.

## UNIX Crontab

The scheduled backup system works on a schedule that is specified using **UNIX Crontab** syntax. This is a standard format for specifying a basic schedule. The format consists of five space-separated fields, one for minute, hour, day-of-month, month, and day-of-week as shown below. The special Gateway Configuration 72 character \* means **all**. Slashes can be used to indicate that values should be stepped, for example, \*/5 in the minutes field means "every 5 minutes", or 0:00, 0:05, 0:10, etc.



### Crontab Format and Ranges

- Minutes - (0 - 59)
- Hour - (0 - 23)
- Day of the Month - (1 - 31)
- Month - (1 - 12)
- Day of the Week - (0 - 6) (0 to 6 is Sunday to Saturday)

## On this page ...

- [UNIX Crontab](#)
- [Set Up Scheduled Backups](#)



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## Making Ignition Gateway Backups

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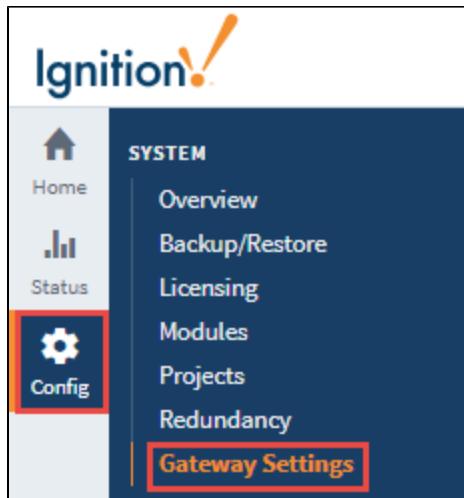
Here are some examples using Crontab formatting:

Examples	
0 1 5 * *	Once a month, on the 5th day at 1am
5 * * * *	Once an hour, on the :05 minute. 0:05, 1:05, 2:05, etc.
30 5 * * 1	Every Monday at 5:30am
* 6-14 * * *	Every minute, but only between 6am and 2pm
*/5 8-17 * * 1-5	Every 5 minutes between 8am and 5pm but only during the week (1-5). 0=Sunday, 1=Monday, etc.
*/15 * * * *	Every 15 minutes, on the quarter-hour. 0:15, 0:30, 0:45; 1:00, 1:15, etc.

## Set Up Scheduled Backups

Gateway backups can be created automatically in Ignition. You can set up a schedule to perform scheduled Gateway backups in the Gateway Webpage. The following is an example of setting up a daily Gateway backup schedule.

1. Go to the Config tab of Gateway Webpage. Under System select **Gateway Settings**.



- On the Gateway Settings page, scroll down to the middle of the page to the **Scheduled Backup Settings** section. The properties in this section allow you to enable and set the backup schedule.

Scheduled Backup Settings	
Enable Scheduled Backups	<input checked="" type="checkbox"/> Enables the scheduled backup system which will automatically make backups at a scheduled time. (default: false)
Backup Folder	\computer\share\backup A path to a folder in which to put the scheduled backups.
Backup Schedule	15 1 * * * A UNIX crontab style scheduling string representing when to make the backups. (default: 15 1 * * *)
Retention Count	14 The number of backups to keep in the backup folder. (default: 5)

- Select the checkbox for **Enable Scheduled Backups**. This enables the scheduled backups to execute at a scheduled time.
  - In Backup Folder, enter a **path** to a folder where the backups will be saved. For example, you can enter:  
\computer\share\backup  
The path to a folder where the backups are to be saved can be a local folder (C:\backups) or a network path (\\\computer\share\backup) as shown in the image above.
  - In **Backup Schedule**, type a UNIX crontab scheduling string to specify when you want to make the backups. For example, the code below makes a backup at 15 minutes and 1 hour after midnight, every day, every month, and every day of the week (1:15am every day).
- ```
15 1 * * *
```
- In Retention Count, specify the number of most recent backups kept in the backup folder. For example, you can specify 14 if you want to only keep the last 14 backups. After 14 backups, the oldest backup will be deleted and the new one will be saved.
  - Click **Save Changes** at the bottom of the page. Now, the Gateway will automatically make backups for you based on the schedule of your settings.

**Note:** If something is wrong with the scheduled backup system, Ignition will store error messages to the [Gateway logs](#).

Related Topics ...

- Project Export and Import
- Gateway Backup and Restore

# Project Export and Import

Project backup and restoring from a project backup is referred to as Project Export and Import. Projects are exported individually, and only include project-specific elements shown in the list below. They **do not** include Gateway level configurations, like database connections, Tag Providers, and Tags. The exported file (.zip) is used to restore / import a project.

The resources listed below are included in a project export.

- Alarm Pipelines
- Named Queries
- Perspective Properties
- Perspective Views
- Project Properties
- Reports
- Sequential Function Charts
- Transaction Groups
- Vision Client Tags
- Vision Windows
- Vision Templates
- Client Event Scripts
- Gateway Event Scripts

## On this page ...

- **Project Export**
  - Export a Project from the Gateway Webpage
  - Export a Project from the Designer
- **Project Import**
  - Import a Project from the Gateway Webpage
  - Import a Project from the Designer

There are two primary ways to export and import a project:

- **Gateway Webpage** - exports and imports the entire project.
- **Designer** - exports and imports only those resources that are selected.

This page describes how to create a project export and import a project from an exported file.



## Making Project Backups

[Watch the Video](#)

## Project Export

A Project Export is a little smaller and takes even less time to run than a Gateway backup! Once you have an exported file of your project, you can take it to any other Gateway and merge it in with the other projects. This makes it simple to keep a development server and push your projects after you complete them. The [Enterprise Administration Module](#) can even do this for you. You can perform a project export from two locations, the Gateway Webpage and the Designer. This section describes how to create a project export from the Gateway Webpage and the Designer.

### Export a Project from the Gateway Webpage

Making an export from the Gateway Webpage, exports the entire project to a (.zip file). The exported file only includes resources from the project. Notably missing from the project export are any Gateway resources, even if they are presented in the Designer such as Ignition Tags. They need to be exported separately. Refer to [Exporting and Importing Tags](#).

**Caution:** Remember that Tags and Gateway level configurations (such as device connections, database connections, tags, etc) are not included in a Project Backup. Those resources are only exported in a [gateway backup](#).

1. Go to the **Config** tab of the Gateway Webpage, and click on **System > Projects**.
2. The **Projects** screen will be displayed and you can see your existing projects.  
To the right of project name, click the **More** button and select **Export**. This exports your project as a .zip file. The exported file will have the project name, date, and a 4 digit unique number followed by the file extension (i.e., Compressor\_2019-03-21\_1123.zip).

The screenshot shows the Ignition Config interface with the 'Config' tab selected. In the left sidebar, under the 'SYSTEM' section, the 'Projects' option is highlighted. The main area displays a table of projects with columns: Name, Description, Enabled, Inheritable, Parent project, and Actions. The 'Actions' column contains buttons for Delete, Details, Copy, Rename, More, and Edit. A red box highlights the 'Export' button for the project named 'NewProject'.

3. By default, the .zip file is saved in your web browser's default Downloads folder. This export of the project can be imported to any other instance of Ignition that is running the same version or later.

## Export a Project from the Designer

When making a project export from the Designer, you get to choose which project resources are added to the export file. The export does not include any Gateway resources. When restoring a project export in the Designer, you also get to choose which project resources are restored into the currently open project from the exported .zip file.

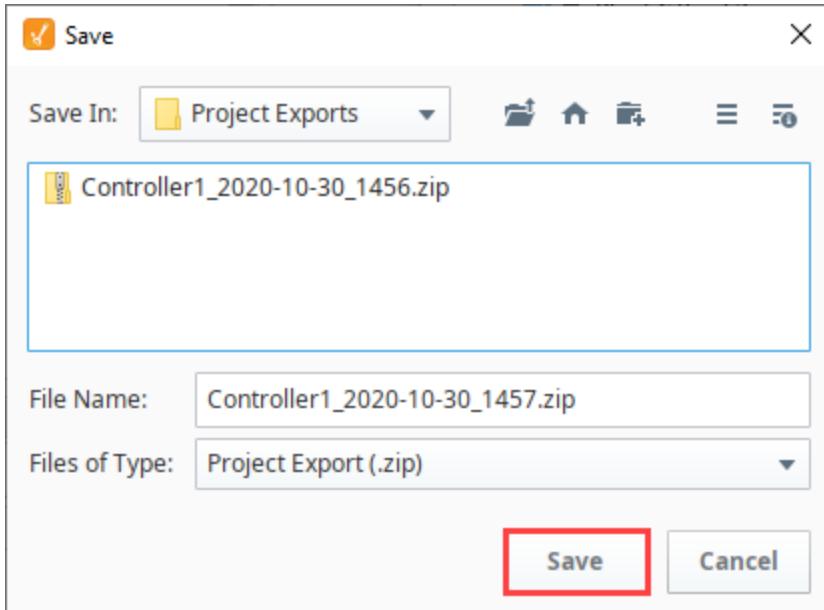
1. From the Designer, go to the top menubar, click on the **File** menu and select **Export**.
2. The Export screen will be displayed and you'll see a list of project resources to export. By default, local project resources are selected. Unselect any resources you don't want to include in the export.

When exporting a project, there is a **Send to Project** button that allows you to directly send the project (or resources in a project) to another project on the same gateway. There is a '**local**' project export option, meaning only local (non-inherited) project resources are selected and will be exported.

Click **Export**.

The screenshot shows the Ignition Designer application. On the left, the 'File' menu is open, with the 'Export...' option highlighted. To the right, a modal dialog titled 'Export Project Resources' is displayed. The 'Select Resources' section contains a tree view of project resources, with several items checked. A red box highlights the 'Perspective Views' item in the tree. At the bottom of the dialog are buttons for 'Select All', 'Local', and 'None', followed by 'Export' and 'Send to Project' buttons.

3. This opens a Save dialog window. Select a folder and click **Save**.



4. This export of the project can be imported to any other instance of Ignition that is running the same version or later.

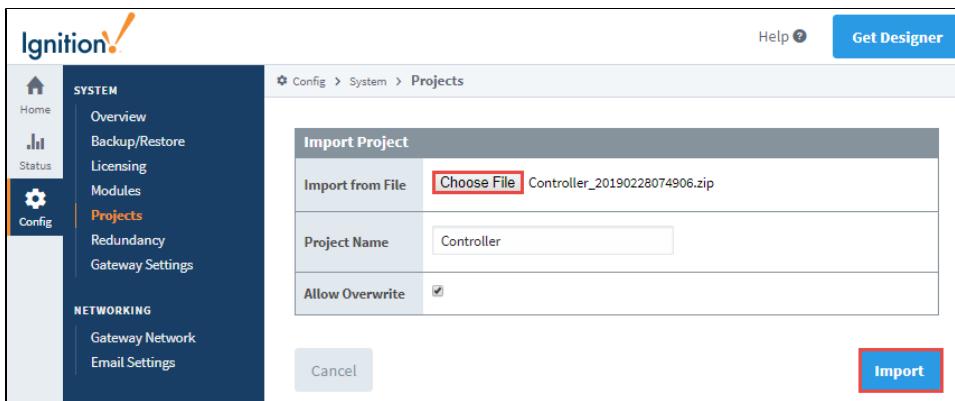
## Project Import

When you restore / import a project from an exported file in the Gateway Webpage, it will be merged into your existing Gateway. If there is a naming collision, you have the option of renaming the project or overwriting the project. Project exports can also be restored / imported in the Designer. This will even allow you to select which parts of the project import you want to include and will merge them into the currently open project.

### Import a Project from the Gateway Webpage

When restoring a project from the Gateway Webpage, Ignition imports the entire project from an exported file.

1. Go to the **Config** tab of the Gateway Webpage, and click on **System > Projects**.
2. The **Projects** screen will be displayed and you can see your existing projects. At the bottom of the screen, click the **Import project...** link.
3. A second Projects screen will open. Click on **Choose File**, find your exported .zip file from your browser, and then click **Open**.
4. Enter the **Project Name**. If there is already a project with the same name, the **Import button** will be grayed out preventing you from importing the file. The system gives you the option to **Rename** the project you want to import, or **Overwrite** the existing project.
5. Click **Import**.



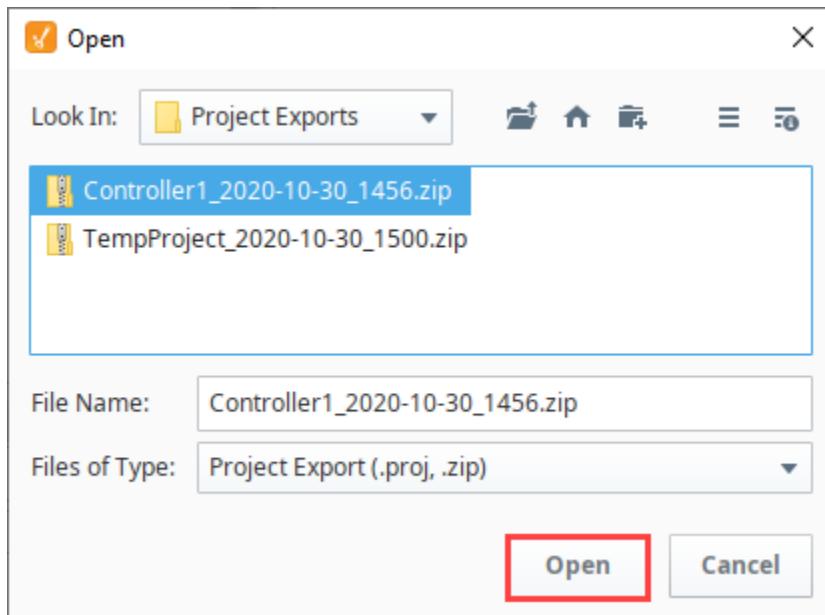
6. If you are importing a new project, you will see your new project added to the list along with the other projects.

### Import a Project from the Designer

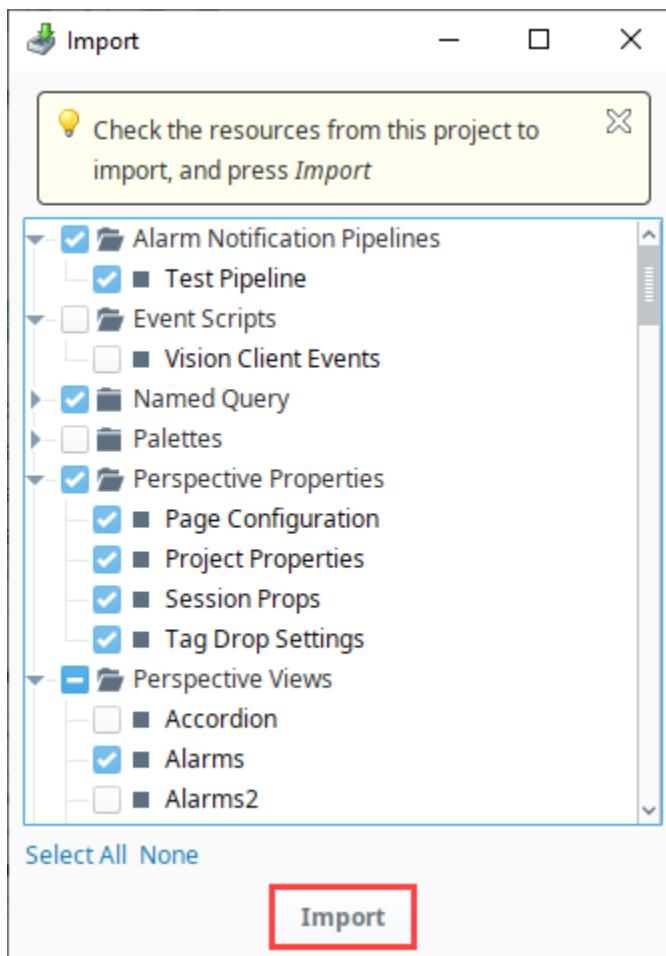
When restoring a project from the Designer, you can select the entire project or parts of the project, and merge them into the one you are currently working on. Ignition will let you choose which resources to import.

1. In Designer, select **File > Import**.

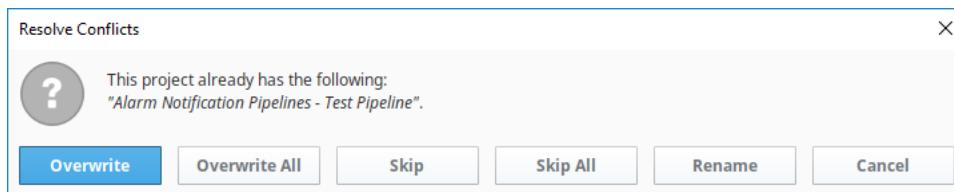
2. The dialog screen will open, select the project export file (.zip) from the default folder, and click **Open**.



3. By default, all resources are selected. Unselect the resources from the project that you do not want to import. Click the **Import** button.



4. If there are any conflicts when importing your project resources, a dialog box will appear and ask you to either **Overwrite**, **Overwrite All**, **Skip**, **Skip All**, **Rename** the affected items, or **Cancel**. Once all conflicts are resolved, **Save** your project.



#### Related Topics ...

- [Gateway Backups and Restore](#)
- [Gateway Scheduled Backups](#)
- [Exporting and Importing Tags](#)
- [Project Inheritance](#)

# Ignition Exchange

In the Ignition Exchange you can access resources, templates, and tools that you can use in your own Ignition projects. The Ignition Exchange offers a wide variety of ways to store and access these resources. Ignition assets designed by others in various industries can be shared through the Exchange. This collection encompasses anything that can be built inside of Ignition including screens, graphics, templates, views, reports, alarm pipelines, scripting functions, database backups, projects, full systems, Ignition demos, and more.

As an individual, you can upload, browse, or download your own tools. If you'd like to keep these tools private, you can store them for your own use, or you can make the resource public, so anyone can access and use it.

Organizations or teams can use the Exchange to store and access private resources they want to make available to a select user group. This gives them the opportunity to collaborate and access company templates, and use them across corporate projects.

## On this page ...

- [Access the Exchange](#)
- [Import an Ignition Exchange Package from the Gateway Webpage](#)
- [Import an Ignition Exchange Project Package from the Designer](#)
- [Restore a Gateway Backup from Ignition Exchange](#)

Discover, share, and download community made Ignition resources in collaboration with your organization or the Ignition community.

+ New Resource

Sort by: New | Popular | Recently Updated

Search

All Resources

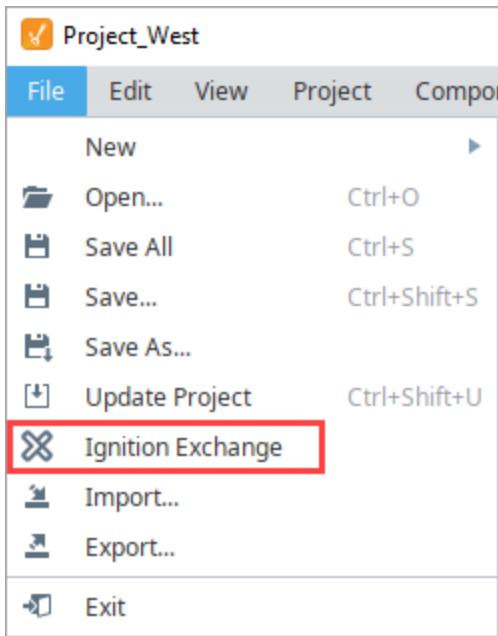
Clear Filters

|                 | SCRIPTS<br>Advanced | PERSPECTIVE VIEW<br>Intermediate | VISION TEMPLATE<br>Beginner |
|-----------------|---------------------|----------------------------------|-----------------------------|
| My Resources    |                     |                                  |                             |
| My Organization |                     |                                  |                             |
| Watched         |                     |                                  |                             |
| Downloaded      |                     |                                  |                             |
|                 | ICC Machine         | Perspective Historical           | Vision Ad Hoc Trend         |

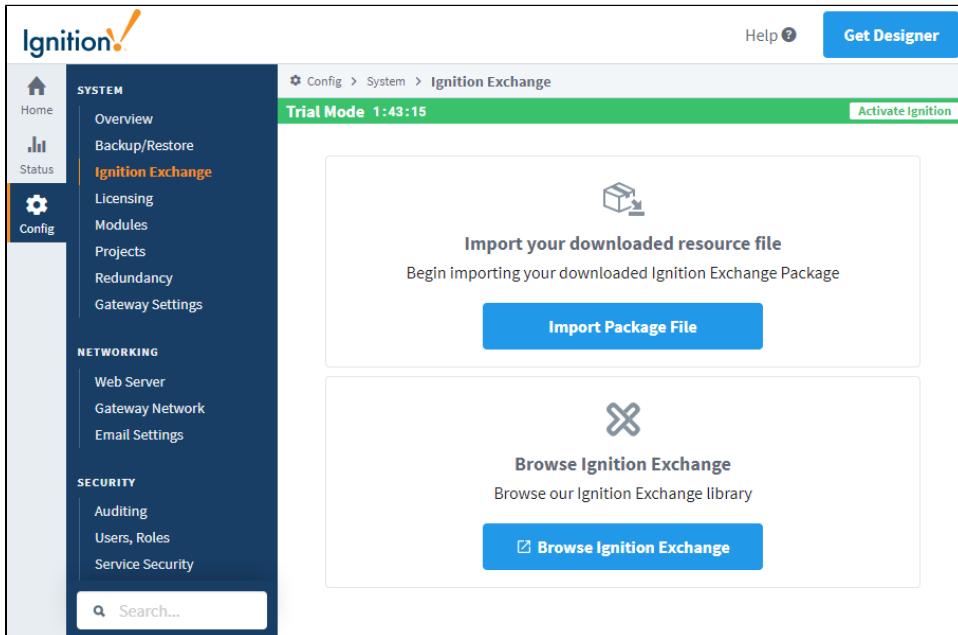
## Access the Exchange

You can access the Ignition Exchange, in several ways:

- Go to <https://inductiveautomation.com/exchange/>.
- Within the Designer, select **File > Ignition Exchange**.



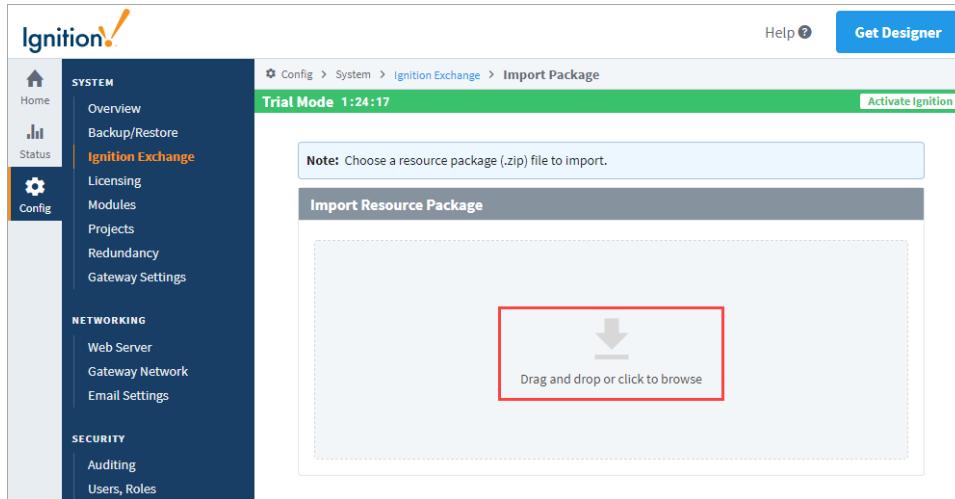
- Within the Gateway webpage, click on **Config > Ignition Exchange**. Then click **Browse Ignition Exchange**.



## Import an Ignition Exchange Package from the Gateway Webpage

When you restore / import a project from an exported file in the Gateway Webpage, it will be merged into your existing Gateway. To import a downloaded resource file,

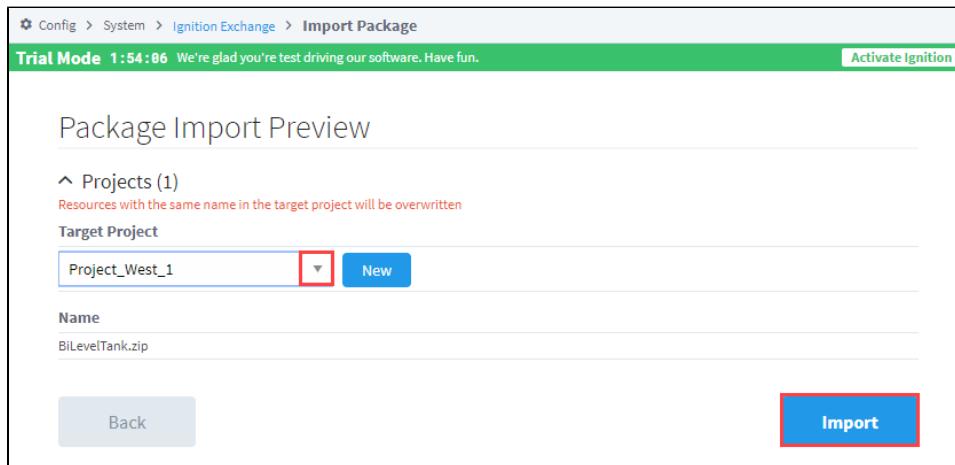
1. Go to the Gateway webpage, and click **Config > Ignition Exchange**.
2. Click on **Import Package File**.
3. Drag and drop your resource package file, or click the link to browse for the file.



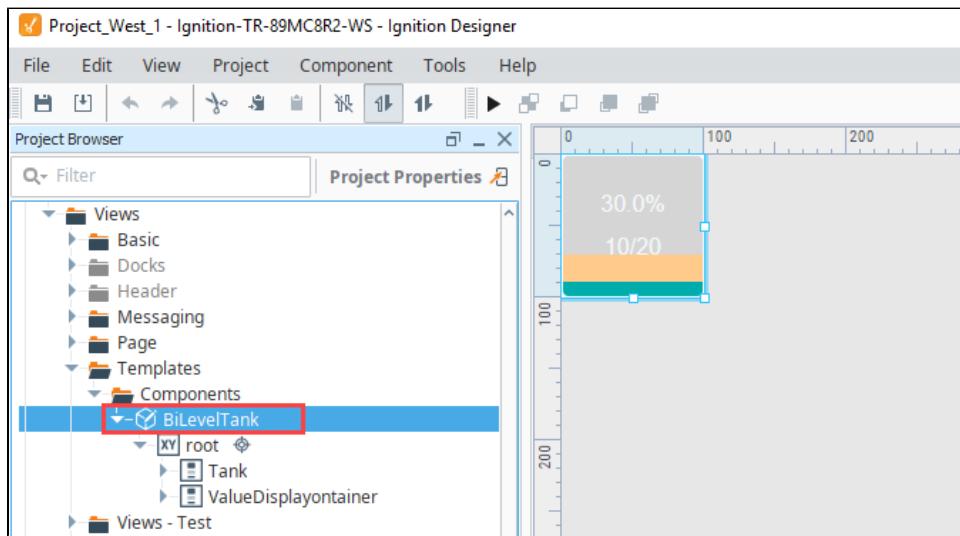
4. Navigate to the file you want to import and click **Open**.
5. The Gateway will display a confirmation message if the package is valid, and it will display some Readme instructions for the file. Click **Next**.
6. The Package Import Preview screen is displayed. Use the down arrow in the Target Project box to choose a project. Then click **Import**.

**Note:** If the new project has a name conflict with an existing project, you can provide a new name for your project.

**Caution:** Resources with the same name in the target project will be overwritten.



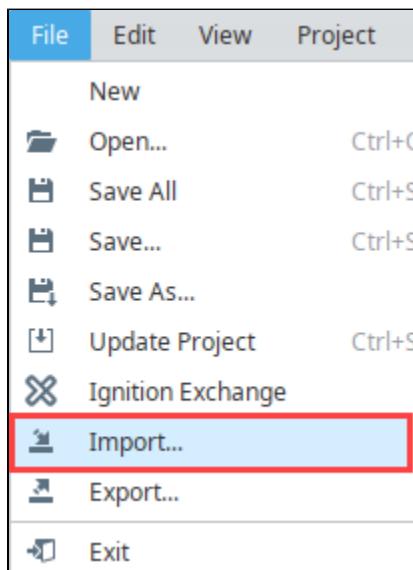
7. A confirmation message is displayed if the package was successfully imported. You can now go to your project in the Designer and see the new resource.



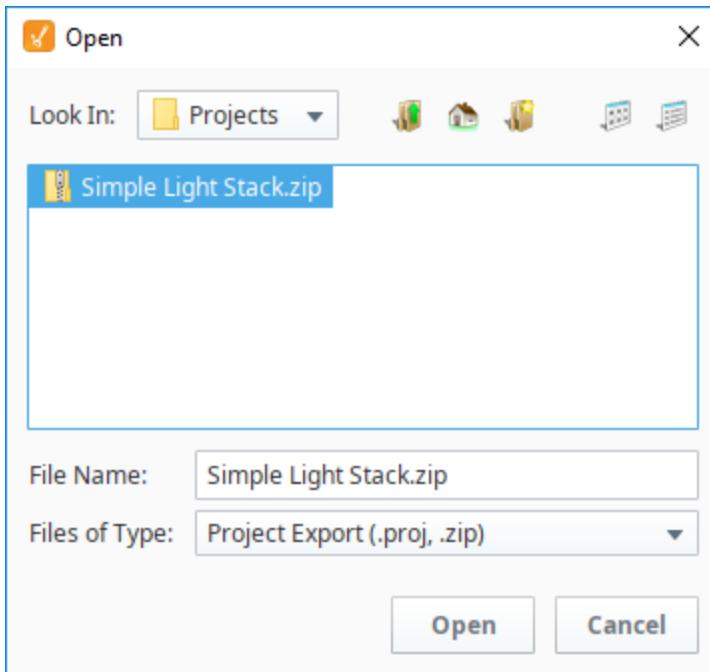
## Import an Ignition Exchange Project Package from the Designer

In this example, we're going to import the Simple Light Stack project that we already downloaded from Ignition Exchange. Note that we also extracted the initial .zip file that was downloaded. This project contains a Perspective view with a light stack graphic. To import this view into a project that is open in the Designer, do the following.

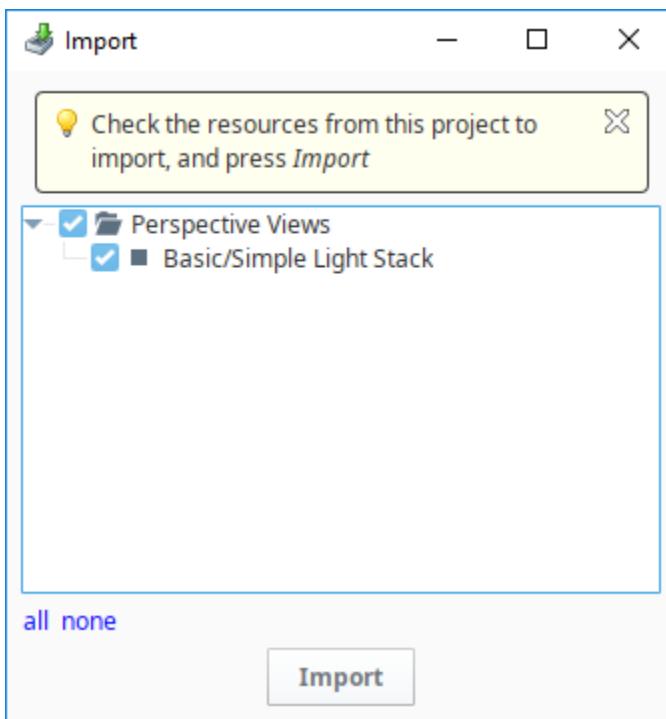
1. In the Designer, click **File > Import**.



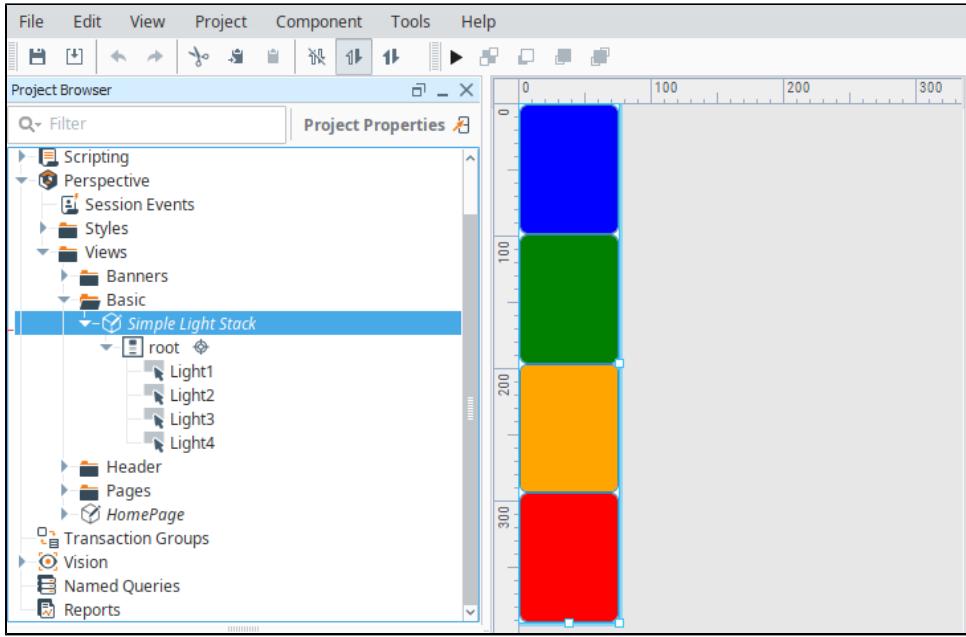
2. Navigate to the project file (.proj or .zip) you want to import, then click **Open**.



3. In the Import popup window, select the resources that you want to import from the project. Click **Import**.



- The view is now part of the current project.



## Restore a Gateway Backup from Ignition Exchange

Ignition Exchange can also have Gateway backup files as resources. After you've downloaded the file from Ignition Exchange, follow the steps for a Gateway Restore in [Gateway Backup and Restore](#).

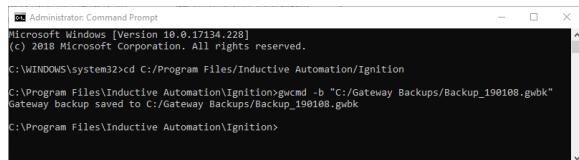
**Caution:** When you perform a Gateway Restore, **ALL** of the server's current configuration will be permanently lost! Restoring a Gateway backup overwrites all of the existing settings including your projects. There is no merge option for a Gateway backup. We recommend you always make a backup of the existing server immediately before performing a Gateway Restore.

# Gateway Command-line Utility - gwcmd

The Gateway Command-line Utility provides a list of commands you can use to perform specific functions in the Gateway. The Gateway Command-line Utility or **gwcmd** provides basic commands, such as resetting the main password, changing the Gateway's port, or restarting the Gateway.

Invoking **gwcmd** can only be done from command line, so you'll need to utilize a command line interface of some sort (Power Shell, Terminal, etc). Because gwcmd is a file sitting in the Gateway's installation directory, these commands can only ever be invoked from where the Gateway is installed. Furthermore, interacting with gwcmd requires administrative privilege.

The gwcmd file sits at the root of the Gateway's installation directory. See the [Installing and Upgrading Ignition](#) page for more details on default installation directories.



```
Administrator: Command Prompt
Microsoft Windows [Version 10.0.17134.228]
(c) 2018 Microsoft Corporation. All rights reserved.

C:\WINDOWS\system32>cd C:/Program Files/Inductive Automation/Ignition
C:\Program Files\Inductive Automation\Ignition>gwcmd -b "C:/Gateway Backups/Backup_190108.gwbk"
gateway backup saved to C:/Gateway Backups/Backup_190108.gwbk
C:\Program Files\Inductive Automation\Ignition>
```

## On this page ...

- [Command-line Utility 'gwcmd' Options](#)
- [Gateway Password Reset](#)

## Command-line Utility 'gwcmd' Options

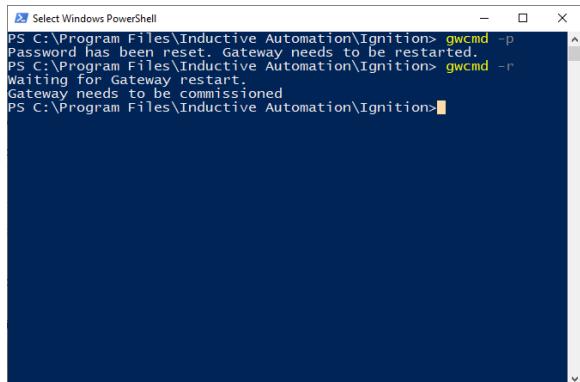
The following table lists all available 'gwcmd' options.

| Options                                           | Description                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -a,--activate <license-key><br>Offline activation | Creates an activation_request.txt file that can be used to request a license.ipl file from the Inductive Automation website. You must specify the <b>license</b> key to use for activation. The activation_request.txt file is saved in the current directory.                                                                                           |
| -b,--backup <new filepath>                        | Downloads a Gateway backup.gwbk file and saves the file to the specified path. The path can be either an absolute path or a relative path.<br><br>If another .gwbk file with the same name already exists, you will be prompted whether it is OK to overwrite the file . You can override with the -y option to force the file to always be overwritten. |
| -c,--clearks                                      | Clears the gateway's SSL / TLS setup. The gateway's SSL / TLS connector will be immediately shut down.                                                                                                                                                                                                                                                   |
| -d, --disabled                                    | Use with the --restore flag to disable all items after gateway restoration and restart.                                                                                                                                                                                                                                                                  |
| -e, --exportks <new filepath>                     | Exports the gateway's SSL key store in PKCS12 format and saves to the specified path.                                                                                                                                                                                                                                                                    |
| -f, --exportpk <new filepath>                     | Exports the private key from the gateway's SSL key store in PEM format and saves to the specified path.                                                                                                                                                                                                                                                  |
| -g,--reloadks                                     | Reloads the Gateway's SSL keystore from disk. Any update to the keystore will be automatically applied to any new connections.                                                                                                                                                                                                                           |
| -h,--help                                         | Shows the usage for this command.                                                                                                                                                                                                                                                                                                                        |
| -i,--info                                         | Retrieves server status and port information from the Gateway if it is running.                                                                                                                                                                                                                                                                          |
| -k,--port <new port>                              | Changes the Gateway http port.                                                                                                                                                                                                                                                                                                                           |
| -l,--sslport <new port>                           | Changes the Gateway https port.                                                                                                                                                                                                                                                                                                                          |
| -n, --nocrypt                                     | Add to the export private key command to not encrypt the private key.                                                                                                                                                                                                                                                                                    |
| -o,--name <new gateway name>                      | Specifies a Gateway name while restoring a backup. Additionally, the -y command now skips prompts asking for a Gateway name override.                                                                                                                                                                                                                    |
| -p,--passwd                                       | Enables a password reset command, which will allow you to create a temporary user that can access the gateway again. Requires a gateway restart to take effect. See <a href="#">Gateway Password Reset</a> below.                                                                                                                                        |
| -r,--restart                                      | Restarts the Gateway.                                                                                                                                                                                                                                                                                                                                    |
| -s,--restore <backup file path>                   | Restores from a Gateway backup, using the file specified at the path.                                                                                                                                                                                                                                                                                    |
| -t,--tdump                                        | Performs a thread dump in the Gateway and prints the dump to the command-line.                                                                                                                                                                                                                                                                           |

|                                         |                                                                                                                                                                                                                                                         |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -u,--unactivate<br>Offline unactivation | Creates an <code>unactivation_message.txt</code> file that you can use to deactivate a license via the Inductive Automation website. The <code>unactivation_message.txt</code> file is saved in the current directory.                                  |
| -w,--uselicense<br><license.ipl path>   | Applies a <code>license.ipl</code> file that was downloaded from the Inductive Automation website. You must supply the location of the <code>license.ipl</code> file. If it is in the current directory, use <code>license.ipl</code> for the location. |
| -y,--promptyes                          | Automatically answers <code>yes</code> to any prompt that may appear in the above commands, such as permission to overwrite an existing file.                                                                                                           |

## Gateway Password Reset

If you can no longer access the Gateway due (due to say a forgotten password), you can use the `-p` command to cause a password reset. During a password reset, instead of just changing the initial user's password, a partial commissioning process will trigger upon the next Gateway restart, allowing you to create a new user that can access the Gateway. From there you'll be able to address any issues that prevented you from using your normal credentials.



```
PS C:\Program Files\Inductive Automation\Ignition> gwcmd -p
Password has been reset. Gateway needs to be restarted.
PS C:\Program Files\Inductive Automation\Ignition> gwcmd -r
Waiting for Gateway restart.
Gateway needs to be commissioned
PS C:\Program Files\Inductive Automation\Ignition>
```



### Password Reset with GWCMD

[Watch the Video](#)

This feature is new in Ignition version **8.1.0**  
[Click here](#) to check out the other new features

However when performing this process, several things will happen to the Gateway:

- During commissioning, you'll be asked to provide a user name and password for a new user.
- A "temp" **user source** is created.
- The user you provided credentials for will be added to the "temp" user source.
- The new user will be assigned the role "Administrator".
- A "temp" Ignition Identity Provider will be created. The "temp" user source will be assigned as the provider backing the Identity Provider.
- On the **General Gateway Security Settings**, the following properties will be changed:
  - **System User Source** will be set to the "temp" user source.
  - **System Identity Provider** will be set to the "temp" identity provider.
  - **Gateway Config Permissions** will be set to the "Administrator" Security Level.

Thus, if you trigger a password reset and are able to use your normal credentials again, you'll want to make sure you change the values on the modified Gateway Security Settings to their property value. Also, you'll likely want to remove the "temp" user source and Identity Providers.

# Projects

## What Is a Project?

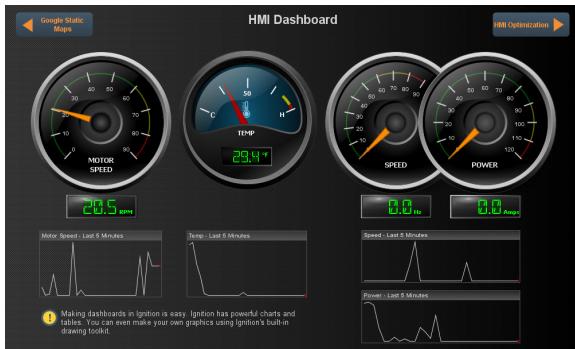
Ignition has two main parts, the Gateway and your projects. The Gateway holds all the shared information like database connections, device connections, Tags, and more. Projects hold all the designed elements that do the real work. Your projects can hold both interactive elements (like controls, charts, reports, entry forms, and more) and persistent elements (like historical loggers, automated reports, etc.).

Projects are predominantly used to create the screens that your users can interact with, the visualization part of Ignition. Here you can create any system you want, from copying existing HMI/SCADA applications to whole new systems with anything you could want to do. The windows in your project can be used for history charts, reports, database forms, alarms, drawing components, scripting, templates and much more.

In Ignition, a project is a unit of configuration that contains:

- **Windows, views, and components:** The HMI and SCADA controls to interact with Tags and databases
- **Transaction Groups:** A bi-directional link between databases and PLCs
- **Templates:** A collection of components that can be re-used and quickly updated
- **Reports:** PDF reports for displaying and recording data
- **Scripts:** Timer and event based scripts used throughout the system
- **General settings and properties:** The settings that control access, resource connections, layout, timing, and more

You use the Designer to configure and create projects. The projects are then viewed in the runtime ([Visio n Clients](#) or [Perspective Sessions](#)). You can create as many projects as you want, and users can easily jump between projects on the fly or open multiple projects at the same time.



## Visualization Systems - Vision and Perspective

When starting a new project, there are many things to consider, such as who the users will be, how much data you need, what kind of time and resources you have to work with, visualization needs, and so forth. Deciding whether to use Vision or Perspective really comes down to which module best fits your project at the visualization level.

### When to Use Vision for a Project

Vision is the best choice for traditional industrial plant-floor and desktop screens, standalone HMIs, and the like. If you need a full, production-ready application right now, then it is best to choose Vision. If you're using multi-monitor or multi-desktop workstations, dedicated control panels and applications, desktop-dedicated or dedicated-access applications, terminals, or parallel screens, then Vision is the best way to go.

### When to Use Perspective for a Project

If you need to build mobile-responsive applications, then Perspective is the recommended way to go. If your application needs to run on a mobile OS, namely iOS or Android, then choose Perspective. If you need Two-Factor Authentication or federated identities for the application you're building, choose Perspective.

With Perspective, you can automatically adapt to fit any screen size using mobile-optimized container types. It provides the ability to use your device's sensors and intuitive touch commands, as well as message handling, flexible property bindings, CSS3 styles, and more.

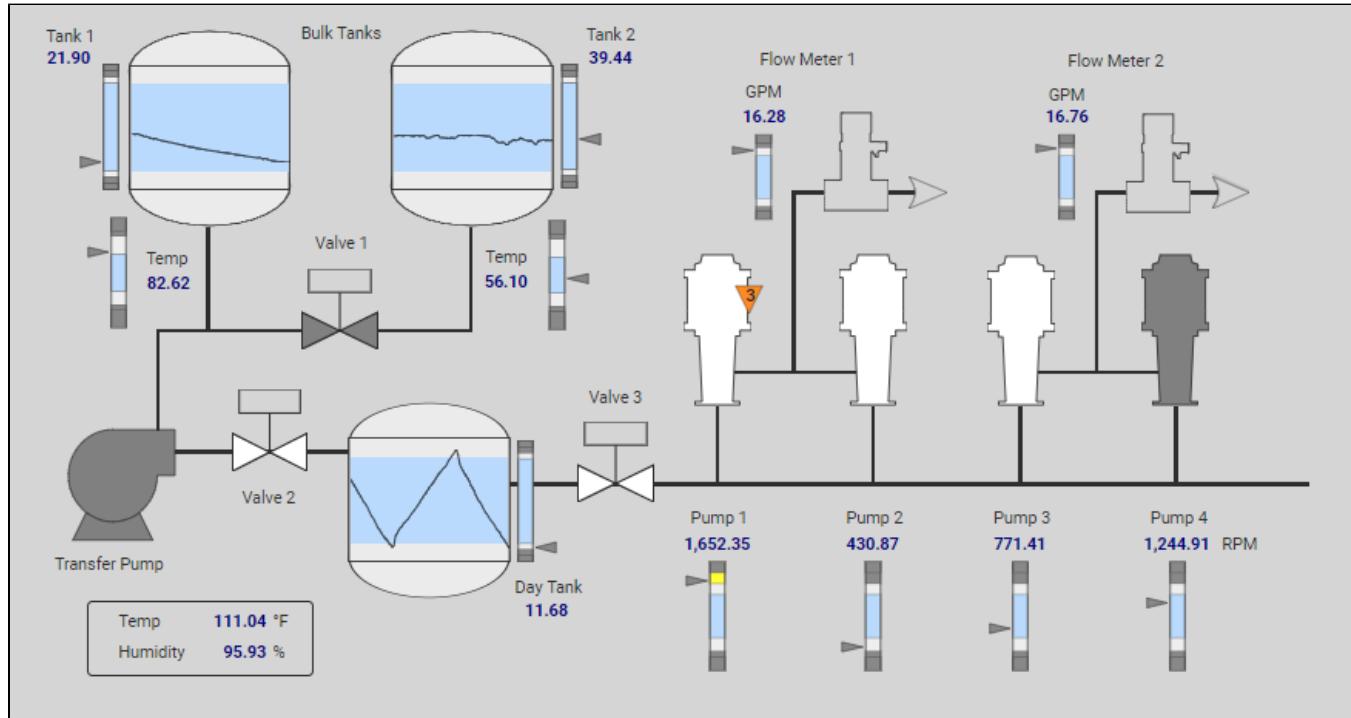
## Designing a Project

## On this page ...

- [What Is a Project?](#)
- [Visualization Systems - Vision and Perspective](#)
  - [When to Use Vision for a Project](#)
  - [When to Use Perspective for a Project](#)
- [Designing a Project](#)
  - [What Is in a Project?](#)
- [Switching Between Projects](#)
- [Project Workflow](#)
- [Project Export and Import](#)
- [Project Versioning and History](#)
- [Project Examples](#)
- [What Is not in a Project?](#)

When you launch the Designer, you're prompted to select or create a project. The Designer then launches the project and you can set and modify the different types of project settings and resources. In the Designer, you can create any number of projects using either Vision or Perspective. Projects that contain viewable elements, such as Vision Windows and Perspective Pages, will have a launch link on the Gateway homepage. Non-viewable elements such as [Transaction Groups](#), [Named Queries](#), [SFCs](#) and [Reports](#) exist in a project and execute in the Gateway. These resources do not have a runtime, and run independently of any [Vision Clients](#) or [Perspective Sessions](#) being open.

There are no limits to the number of projects that can be created on a Gateway, but each runtime Client, Session, or Designer can operate only on one project at a time.



## What Is in a Project?

You use the different tools in Ignition such as components, shapes, images, Symbol Factory graphics, and Scalable Vector Graphics (SVGs) to create the components. Configuring components is the bulk of the designer's work when designing a project. The basic workflow is to take a component from the palette and drop it into a container on a Vision Window or Perspective View. You can use the **Property Editor** panel to alter the component's properties which changes the component's appearance and behavior.

To make the component do something useful, like display dynamic information or control a device register, you configure property bindings for the component. To make the component react to user interaction, you configure event handlers for it. It is primarily through property bindings that you bring windows to life, and have them do useful things. A property binding simply links one component's property to another on the same window.



## Switching Between Projects

When you launch an Ignition Client or Perspective Session, it opens a single project to display. If you want to open multiple projects you can have multiple clients open on the same computer, or you can use Ignition's [Retargeting](#) system to make seamless transitions between projects. The Retargeting feature allows you to jump from one project to another without closing the client. This allows your users to jump from area to area while still allowing you to keep your designs compartmentalized in multiple projects.

Your projects may all use different authentication sources or role sets for [security](#). This means as your users jump from project to project, they may be able to use some or all of the controls on one project, but only see what is happening on another project.

## Project Workflow

Getting up and running quickly with your project is simple:

1. Open the Designer
2. Choose either Perspective or Vision.
3. Start designing!

The only challenge is figuring out exactly what you want to make with your system. For additional information, see [Creating a Project](#).

## Project Export and Import

In Ignition, a project backup and restore is referred to as Project Export and Import. Projects are exported individually and only include **project-specific** resources such as Perspective Views, Perspective properties, Vision Windows, Vision Templates, client event scripts, alarm pipelines, named queries to name a few. They **do not** include any Gateway resources like database connections and Tag Providers. A project is exported to a **.zip** file, and you can import it to any other Gateway that you have permission to access.

When you import a project from the **.zip** file, it will be merged into the existing Gateway. If a project already exists on the Gateway you are attempting to import it on, you have the option of renaming the project or overwriting the existing project.

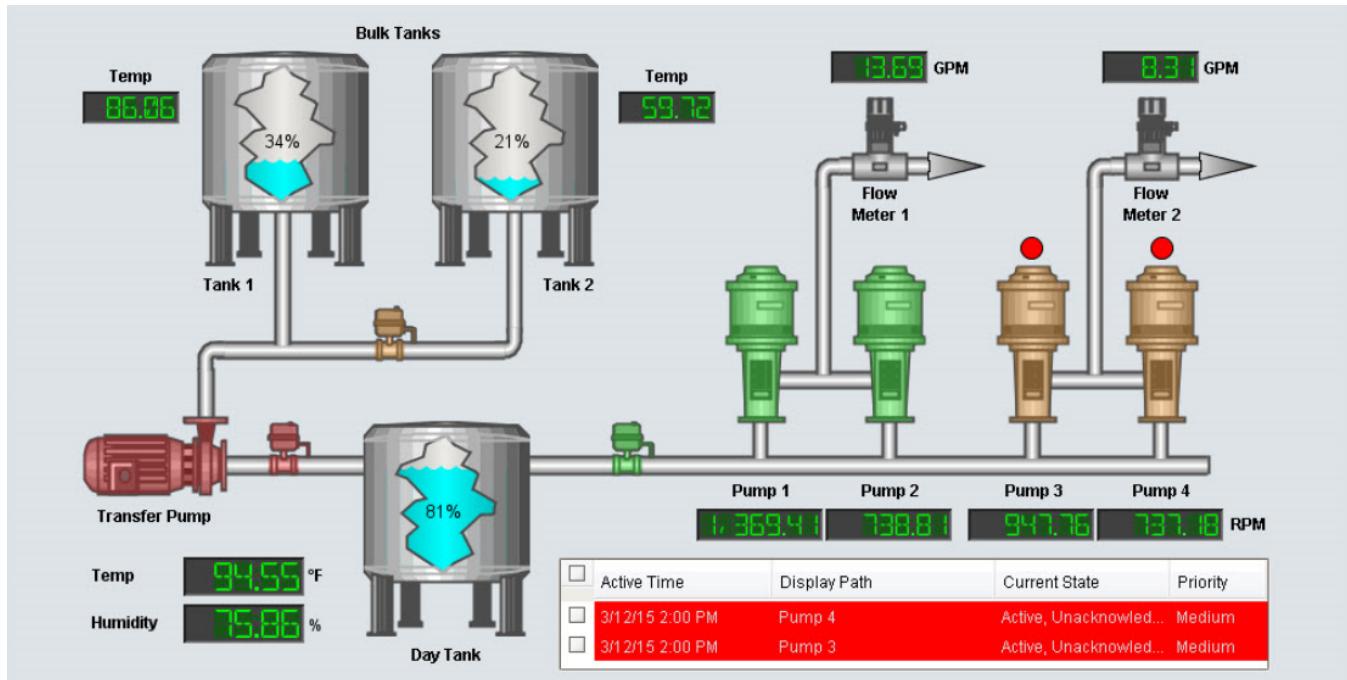
Project Export and Import are covered in detail on the [Project Export and Import](#) page.

## Project Versioning and History

Project versioning is handled outside of Ignition. The file system that stores data in Ignition stores everything as a series of files. You can use any tool you'd like to save or export these files outside of Ignition, including using versioning software to keep track of your changes.

## Project Examples

Ignition is such a diverse application that it can work in any field you can imagine and more. Just a few examples: Oil and gas, food and beverage, automotive, medical, air traffic control, water - waste water, and many more. You can get anything you want set up in Ignition. To see a few live example screens, check out our online demo project examples for [Vision](#) and [Perspective](#). They are packed with samples of the features and functions you might want to use from reporting, to history, to HMI optimization.



## What Is not in a Project?

The Designer allows you to create and modify several types of resources that are shared by ALL projects. Depending on the resource, this means that either they run independently of the projects, or they are available for use by any project. Here are a few of them:

- [Alarm Pipelines](#) - Control alarm notification (runs independently).
- [Sequential Function Charts \(SFC\)](#) - Logic to step through a process (runs independently).
- [Transaction Groups](#) - Perform various actions such as storing data historically, synchronizing database values to OPC, or loading recipe values.
- [Project Library](#) - Blocks of scripting code (available to all projects).
- [Tags](#) - Basic or UDT Tags provide realtime data (available to all projects).
- [Alarming](#) - Alarms exist on Tags, and so are not in a project (available to all projects).

In addition to these resources, the Gateway connections and settings are available to all projects and are set up in the [Gateway](#). These include resources such as [database connections](#), [OPC server and device connections](#), and more.

#### Related Topics ...

- [Designer](#)
- [Perspective Sessions](#)
- [Property Bindings in Perspective](#)
- [Scripting in Perspective](#)
- [Vision Client Launcher](#)
- [Property Bindings in Vision](#)
- [Scripting in Vision](#)
- [Alarming](#)
- [SQL Bridge \(Transaction Groups\)](#)

#### In This Section ...

# Project Inheritance

Project Inheritance allows one project to inherit resources from another project. If you have project resources that you want other projects to use such as views, windows, scripts, templates, or pipelines, you can create an inheritable project allowing other projects to inherit those resources. The project inheriting the resources can also overwrite the resources and let you re-define them specifically for that project.

Project inheritance is extremely flexible in that it allows each project to have a parent project that inherits all the resources of that parent project. The inherited project, in turn, can also be configured to be 'inheritable' and become a parent project itself allowing for complex hierarchies of re-usable resources to be designed. Within each project, inherited resources may be used by other, "local" resources. For example, an inherited Vision template could be embedded in a window, or an inherited script could be executed by a button.

This page demonstrates how project inheritance allows you to share resources across multiple projects as you deem fit by pointing one project to another project, and overriding resources to re-define resources specifically for the project you're working on.

## Configuring Project Inheritance

In order to make a project inheritable, you need to enable project inheritance on the project containing the resources that you want to share.

In this example, we have two projects: one project called 'global' which contains some project resources, and another project that is not inheriting any resources called 'Project\_X.' Since we will be sharing the resources from the 'global' project with Project\_X, let's first configure the 'global' project to be inheritable.

## On this page ...

- Configuring Project Inheritance
  - Configuring Parent Project
  - Configuring Child Project
  - Using Inherited Resources
- Inheritance and "Runnable" Resources
  - "Runnable" Resources
- Overriding Inherited Resources
  - Deleting Inherited Resources
  - Renaming an Inherited Resource
- Inheritable Project Examples
- Project Export



## Project Inheritance

[Watch the Video](#)

## Configuring Parent Project

1. Go to the **Config** tab on the Gateway Webpage, and select **Systems > Projects**. This brings up a list of all your projects. You'll notice that for each project listed, you'll see at a glance if a project is Inheritable, and if so, the name of the Parent Project will be displayed.

A screenshot of the Ignition Gateway Webpage. The left sidebar has tabs for Home, Status, and Config, with Config selected. Under SYSTEM, the Projects tab is highlighted with a red box. The main area shows a table of projects with columns: Name, Description, Enabled, Inheritable, Parent project, and Actions. A red box highlights the 'Inheritable' column for the 'global' project, which is set to true. The 'Parent project' column for 'global' shows 'global'. Other projects like 'Project\_X' and 'Controller1' are shown with their respective settings.

| Name        | Description | Enabled | Inheritable | Parent project | Actions   |
|-------------|-------------|---------|-------------|----------------|-----------|
| global      |             | true    | true        | global         | More Edit |
| Project_X   |             | true    | false       |                | More Edit |
| Controller1 |             | true    | false       | global         | More Edit |

2. Find the project you want to make inheritable, and click the **Edit** next to the project name (i.e., global) to open the Project Settings window.
3. Enable the **Inheritable** property, and click **Save**.

### Allow Overrides

When you make a project inheritable, the Allow Overrides function is set by default on all project resources in the inheritable project. This allows all project resources to be propagated to all inherited projects

| Project Settings |                                                                                                                                                                                  |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name *           | global<br>Choose a name to identify this project.                                                                                                                                |
| Description      | <br><br><br>                                                                                                                                                                     |
| Title            | <br>The title for the project. This can contain more characters than the name (space, etc), and will be used to represent the project to users. If empty, the name will be used. |
| Enabled          | <input checked="" type="checkbox"/> A disabled project will not be active on the Gateway, but will remain editable in the Designer.                                              |
| Inheritable      | <input checked="" type="checkbox"/> Inheritable projects are not runnable as a stand-alone project, but are intended to provide shared resources to one or more child projects.  |
| Parent Project   | -None-                                                                                                                                                                           |

#### Cannot Launch Inheritable Projects

When you have a project that's flagged as inheritable, you can not launch it as a stand-alone project (i.e., Perspective Session or Vision Client). You will get a 'Project Not Runnable' error message. If you have an inheritable project that you want to launch, you must have another project to inherit from it.



## Configuring Child Project

Now that we have an inheritable project, let's setup an existing project (i.e., Project\_X) so it inherits resources from the 'global' project.

1. Under the **Config** tab select **System > Projects** page
2. Find your project and click the **Edit** button.
3. Select the inheritable project from the **Parent Project** dropdown list (i.e. global), and click **Save**.

### Project Settings

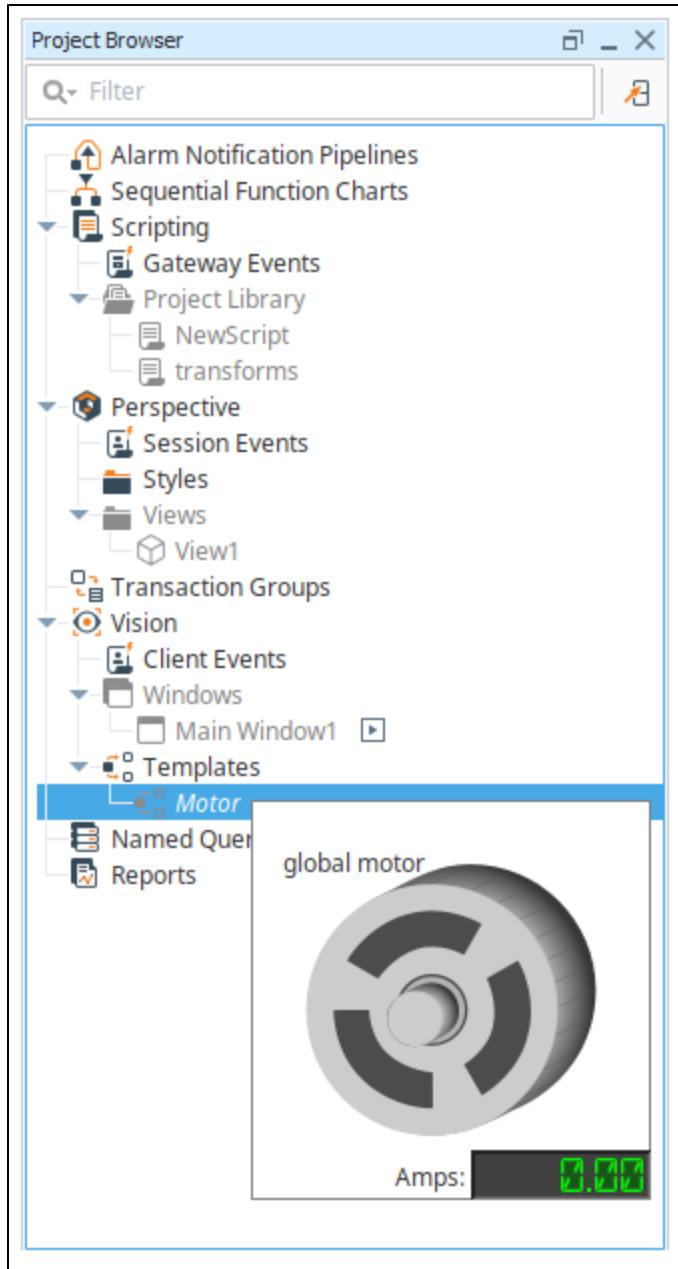
|                |                                                                                                                                                                              |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name *         | Project_X                                                                                                                                                                    |
|                | Choose a name to identify this project.                                                                                                                                      |
| Description    |                                                                                                                                                                              |
| Title          | The title for the project. This can contain more characters than the name (space, etc), and will be used to represent the project to users. If empty, the name will be used. |
| Enabled        | <input checked="" type="checkbox"/> A disabled project will not be active on the Gateway, but will remain editable in the Designer.                                          |
| Inheritable    | <input type="checkbox"/> Inheritable projects are not runnable as a stand-alone project, but are intended to provide shared resources to one or more child projects.         |
| Parent Project | global                                                                                                                                                                       |

## Using Inherited Resources

You can treat an inheritable project as a library of resources for use in other projects. When project resources are changed in the original project, these changes will get passed down to the inherited projects. The same thing is true if new resources are added to the inheritable project. By using inheritable projects, you can create a resource library that will help designers build their projects more quickly, ensure consistency and reusability across all their projects.

To view your inherited resources, go to the Designer and open your inheriting project (i.e., Project\_X). Expand the folders that contain resources, and you'll notice that the inherited project resources are grayed out, including the Perspective Views and Vision Windows folders. Grayed out resources mean that those resources are inherited, and can only be edited from their original / parent project. Anytime a new resource is added or an existing resource is changed in the inheritable / parent project, it will propagate down to the inherited project and will appear grayed out unless that resource is overridden.

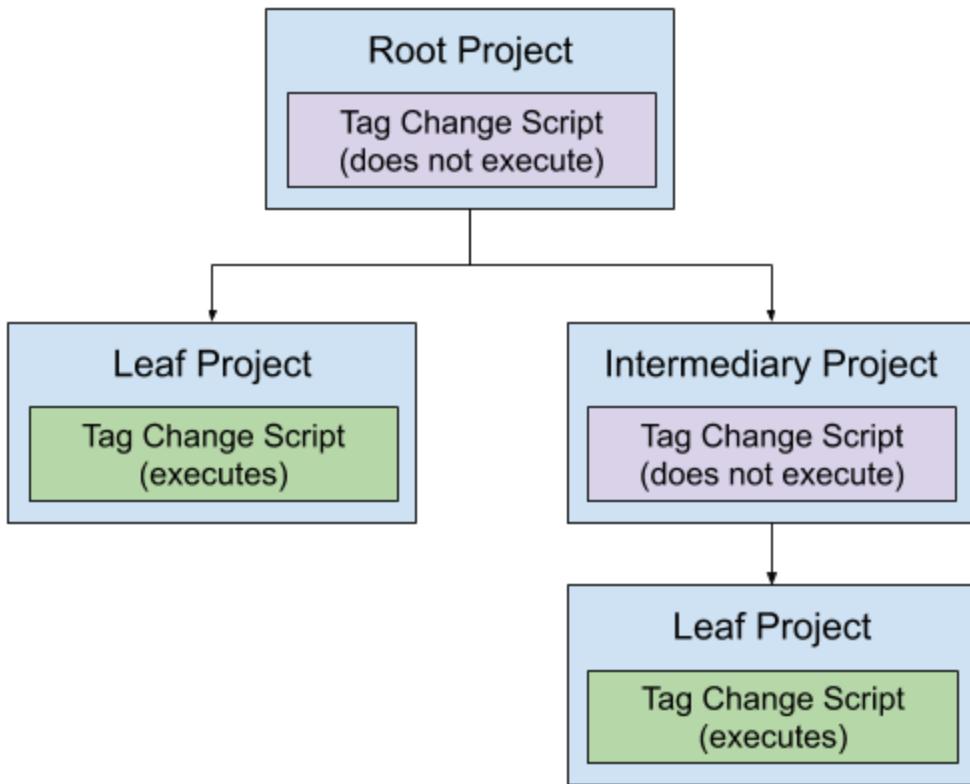
You can view a grayed out resource by either selecting the **Open read-only** option or hovering your mouse over the resource name in the Project Browser. Each resource displays a little differently: hover over the resource using your mouse, or click on the resource name to open it.



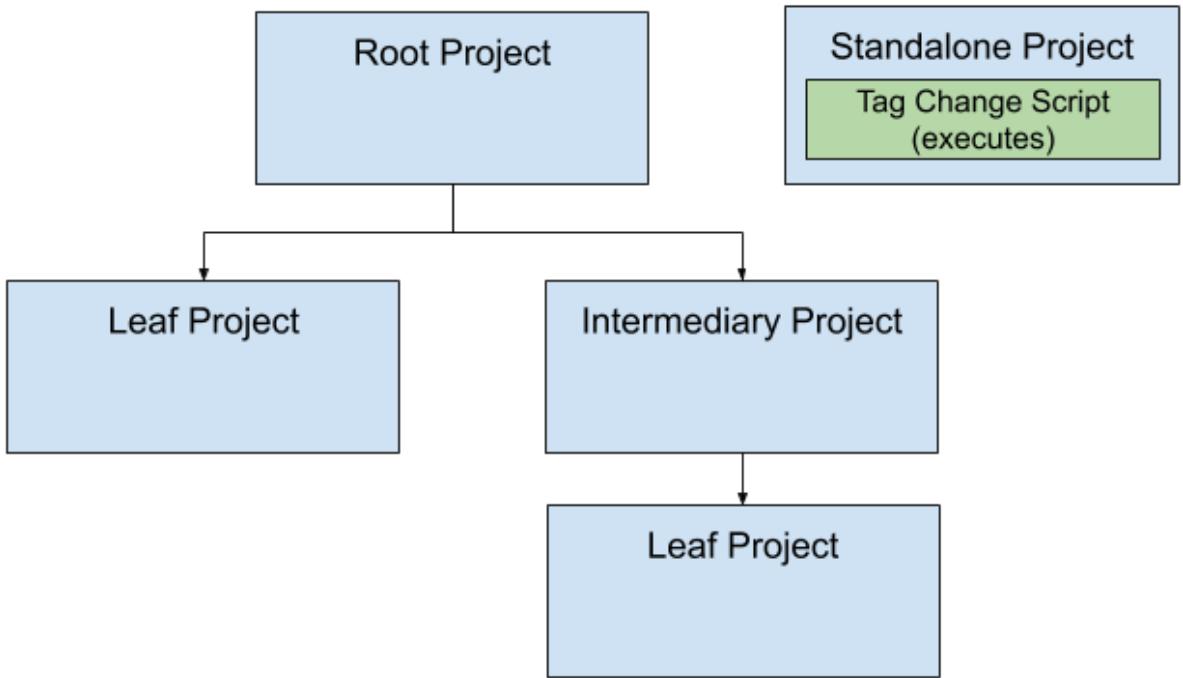
## Inheritance and "Runnable" Resources

Some resources in a project "run" or execute in every leaf project (that is, a project that is **not** inherited by any other project) in the inheritance chain. Thus, if multiple projects inherit from the same parent project, then each leaf project will contain runnable resources, potentially resulting in duplicate executions.

The diagram below represents an inheritance hierarchy on a single gateway. A "Root" project contains a Gateway Tag Change script. Two projects inherit from the Root, so they'll inherit the script. In both cases, the inheritance chain leads to leaf projects. In this single gateway, two running instances of the same tag change script exist, meaning there will be duplicate script executions.



In the case of resources that "run", it is highly advised that they exist in a leaf project, or a standalone project (a project that does not participate in inheritance at all). In regards to the diagram above, we could prevent duplicate execution of our Tag Change Script easily by moving the Tag Change Script to a separate, standalone project:



## "Runnable" Resources

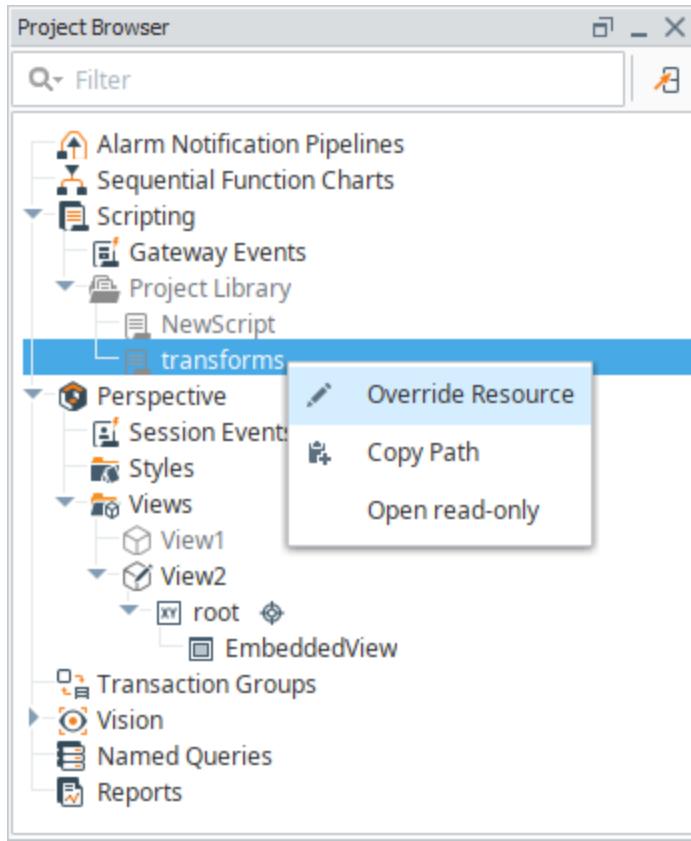
The following resources are considered "runnable":

- [Gateway Event Scripts](#)
- [Alarm Notification Pipelines](#)
- [Sequential Function Charts](#)
- [Transaction Groups](#)

## Overriding Inherited Resources

To edit a resource in an inherited project, you need to override the resource by right clicking the resource and selecting **Override Resource**. By overriding the inherited resource, the resource is recreated in the inherited project, and any future changes made to the original project resource will *not* propagate down to the inherited resource.

If new resources are added in the inheritable / parent project, they will automatically propagate down to inherited projects. New resources that are added in the inherited project will be displayed as grayed out. You will need to override each new resource to edit it.

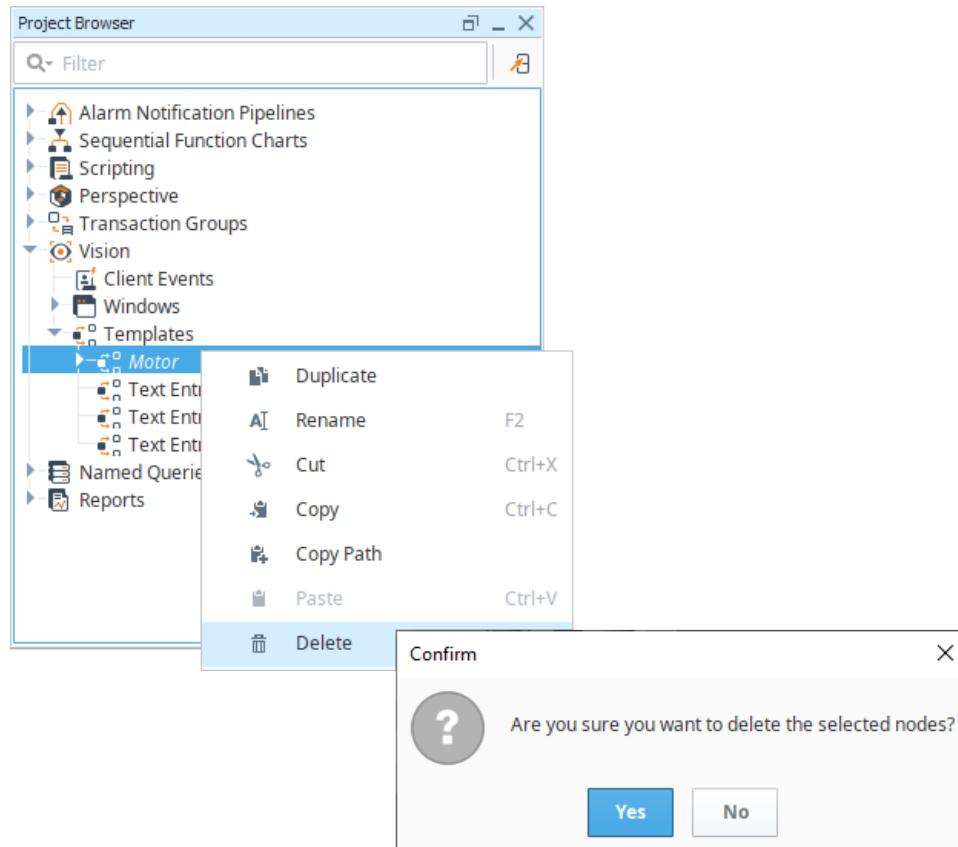


## Deleting Inherited Resources

Inherited resources that have been overridden can be deleted from an inherited project. When you delete an inherited resource, it doesn't delete the resource from the inheritable / parent project, it deletes the 'Override' you previously placed on the inherited resource. The inherited project resource will return to the version that is currently in the inheritable / parent project (without your edits), and the resource becomes grayed out in the Project Browser.

1. To delete the override on an inherited resource, right click on the resource and select **Delete**.

2. A dialog box will popup confirming you want to delete the selected node, click **Yes**. The resource will immediately be grayed out preventing designers from editing that resource.



## Renaming an Inherited Resource

You can easily rename an inherited resource, but beware that when you rename a resource, the inheritable project will propagate the original resource to the inherited project. For example, say you have an inheritable project resource named 'Map\_Transform' and you renamed it to 'CA\_Map\_Transform.' Ignition knows that the original project resource is no longer there, and because the project is flagged as inheritable, it will propagate that original resource to the inherited project. Now you have both the renamed 'CA\_Map\_Transform' and the original inheritable resource 'Map\_Transform.'

## Inheritable Project Examples

There are many ways how you might want to configure and organize your inheritable projects. It's whatever works best for your organization and design projects. Here are a couple of common ways to organize your shareable resources.

- You can create one inheritable project that contains many project different resources: scripts, pipelines, views, templates, windows, SFCs, etc. This is one inheritable project containing all your inheritable project resources.
- Another option is to create several inheritable projects. You can have one inheritable project dedicated for each type of resource: one for scripts, one for views, one for templates, one for pipelines, etc.

## Project Export

When a [project is exported](#), you don't get any inherited resources with your export. However, if a project resource was overridden and edited, that essentially becomes a new resource and will be included in a project export. Resources that are inherited and not overridden will have to be included as part of an inheritable project export. Once a new project is imported into a Gateway, you can always configure that project to inherit from another project.

### Related Topics ...

- [Project Inheritance - Upgraded Features in Ignition 8](#)
- [Project Export and Import](#)



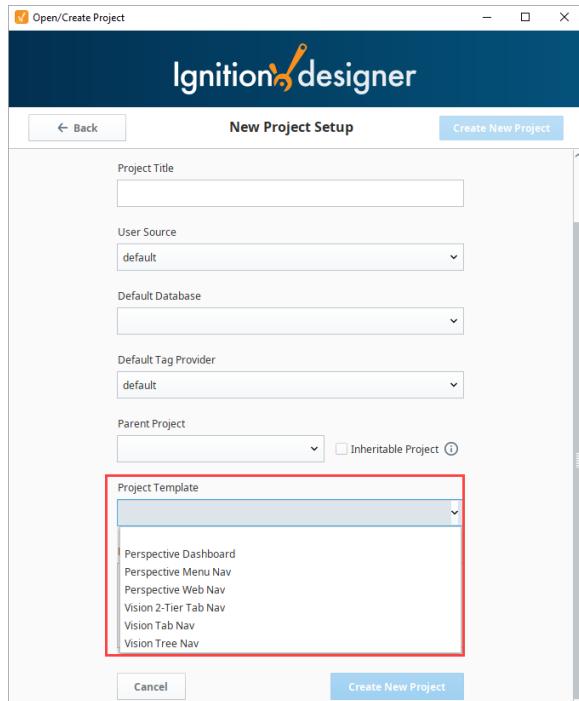
# Project Templates

When you [launch the Designer](#), you will be presented with the Open/Create Project window. This window lets you hit the ground running almost immediately by populating a few fields, the most important ones being your project Name and Title. You can use the defaults in the remaining fields and change them in the **Config > Project** page later, but don't overlook the **Project Template** field. Ignition provides several project templates for you to choose from to help you quickly get started developing your project in either Perspective or Vision. The templates get you started with a basic navigation structure and let you add more items as your project matures.

**Note:** You must be connecting to the Internet in order to see the templates available in the Project Template list.

## On this page ...

- [Perspective Project Templates](#)
  - [Web Nav](#)
  - [Perspective Menu Nav](#)
  - [Editing Properties and Page Configuration Settings](#)
  - [Widget Dashboard](#)
- [Vision Project Templates](#)
  - [Tab Nav](#)
  - [2-Tier Tab Nav](#)
  - [Tree Nav](#)
  - [Adding Windows to the Navigation](#)



## Perspective Project Templates

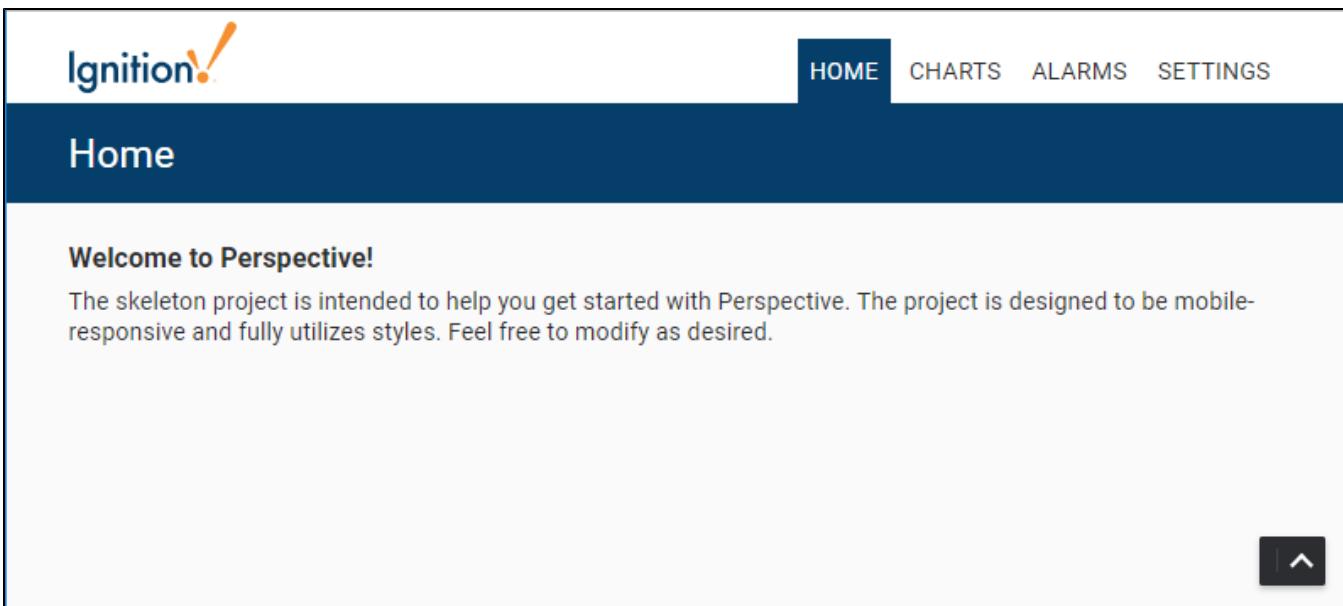
Here are two Perspective Project Templates you can choose from to get you off to a quick start: **Menu Nav** and **Web Nav**.

The Perspective Menu Nav and Web Nav templates contain several pre-defined views: Home, Charts, Alarms, and Settings. These views can easily be edited by selecting the view in the Project Browser and editing its Props to anything you want them to be. You can also go to the [Page Configuration](#) and edit the page configuration settings and [docked view](#) properties.

The images below show what the Menu Nav and Web Nav look like in a Perspective Session.

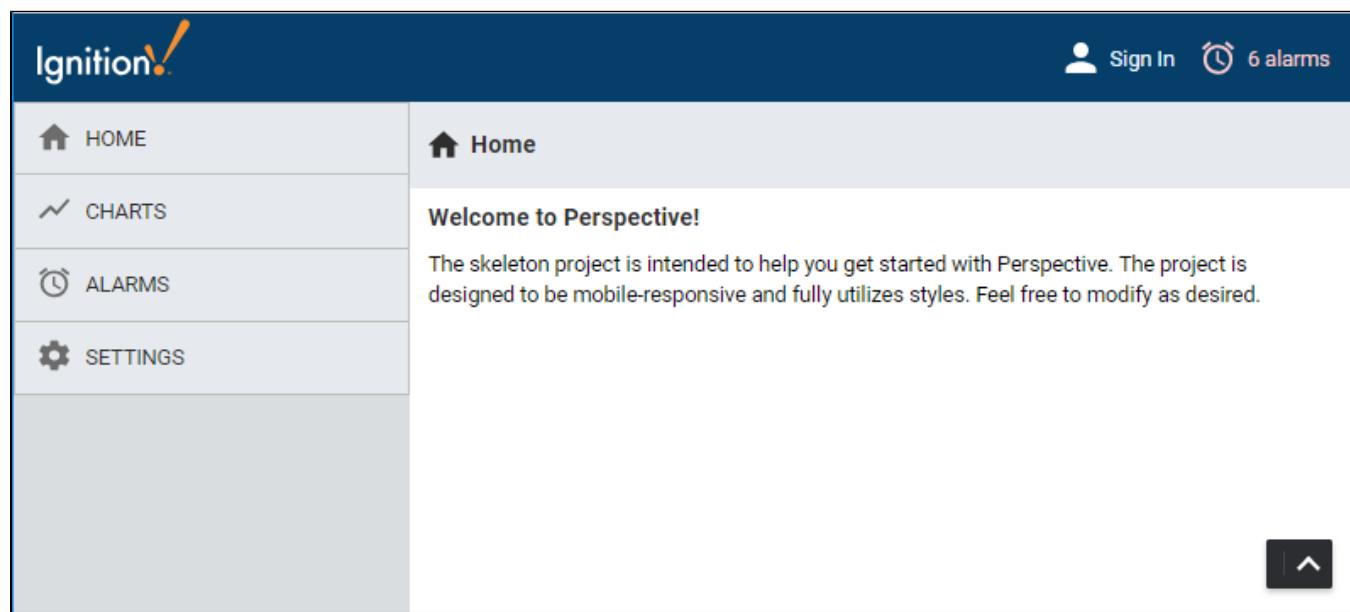
### Web Nav

The Web Nav is good for small size project structures where you only have a few main Views. It allows you to navigate the areas of your project using the tabs at the top of the screen. It has a docked view that contains tabs that are always open to do navigation, and the main view which fills the rest of the space. It is a flat structure similar to the what you see on many webpages.



## Perspective Menu Nav

The Menu Nav template is a hierarchical view of groups of information that can be configured to expand submenu branches and menu items and is docked on the left side of the screen. The Menu Nav is good for medium and large project structures because you can expose important information at a glance and allow users to navigate and expand submenus if any exist. The menu automatically hides itself on smaller screens devices.



## Editing Properties and Page Configuration Settings

To edit the Menu Nav and Web Nav menus, first you have to have pages configured in your project. Once you have pages configured, you can go to the Navigation view in the Project Browser, select the component and change the corresponding component props in the Perspective Property Editor to add, remove, or update the menu items.

### Page Configuration Settings

### Page Configuration

**Shared settings**

- / → Page/Home
- /alarms → Page/Alarms
- /charts → Page/Charts
- /settings → Page/Settings

**Header BP Large**

**Corner Priority**

**left-right** **top-bottom**

**Menu**

**Configure Docked View**

**View**: Docks/Menu

**Display**: auto, **Resizable?**: false

**Content**: push, **Modal?**: false

**Size**: 260, **Auto Breakpoint**: 768

**Dock ID**: menu, **Handle**: hide

**Handle Icon**: (empty)

**View Parameters**: + Add Object Member...

### Project Browser and Project Editor

**File Edit View Project Component Tools Help**

**Project Browser**

**Perspective Property Editor**

**Perspective Components**

**Home**

Welcome to Perspective!

The skeleton project is intended to help you get started with Perspective. The project is designed to be mobile-responsive and fully utilizes styles. Feel free to modify as desired.

**Views**

- Banners
- Header
- Pages
- Alarms
- Charts
- Home
- root
- Container
- Banner
- Spacer Banner
- Content
- Spacer Footer
- Settings

**PERSPECTIVE PROPERTY EDITOR**

**PROPS**

- path : Banners/Ti...
- params (1)
- title : Home
- useDefaultViewWidth: false
- useDefaultViewHeight: false
- style (1)
- classes :

**POSITION**

- basis : auto
- grow : 0
- shrink : 0

**CUSTOM**

+ Add Custom Property...

**META**

- name : Banner
- visible : true
- rotate (2)
- anchor : 50% 50%
- angle : 0

## Widget Dashboard

The Widget Dashboard template allows you to configure a dashboard for individual users. A dashboard can be added and configured in such a way that only a particular user like an administrator or even a guest can view it when logged into the session. It has built-in widgets included with the template that you can access to design your dashboard.

To get your project working you must first set a valid default [database connection](#) under **Config > Project Settings** on the Gateway Webpage. You don't need to edit any of the views in Designer. Just open a session and login since the project requires an authenticated user to add and edit a dashboard.

The screenshot shows a symmetrical dashboard interface. On the left, a sidebar displays the text "Add Dashboard" and "No dashboards exist. Click add to create a new dashboard." Below this is a blue button labeled "+ ADD DASHBOARD". At the bottom of the sidebar are three icons: a plus sign (+) for "Add Dashboard", three horizontal lines for "Reorder", and a user icon for "Guest". The "Guest" icon is highlighted with a red border. On the right, the main dashboard area also displays "Add Dashboard" and "No dashboards exist. Click add to create a new dashboard." It features a similar blue "+ ADD DASHBOARD" button. The top navigation bar includes a "light-cool" color palette and a refresh/circular arrow icon. The overall layout is clean and modern, designed for easy customization.

Move your mouse over the dashboard and you'll see a plus icon appear. A dropdown list of built-in widgets will be displayed. Select your widget and press **Add**. The widget will appear on your dashboard. To edit the widget, click the edit icon on the widget, and when you're finished, click **Save**. Add as many widgets as you want.

PROJECTONE

### Edit Dashboard

DETAILS WIDGETS

Breakpoints  
0px

Gauge

Hand

Off

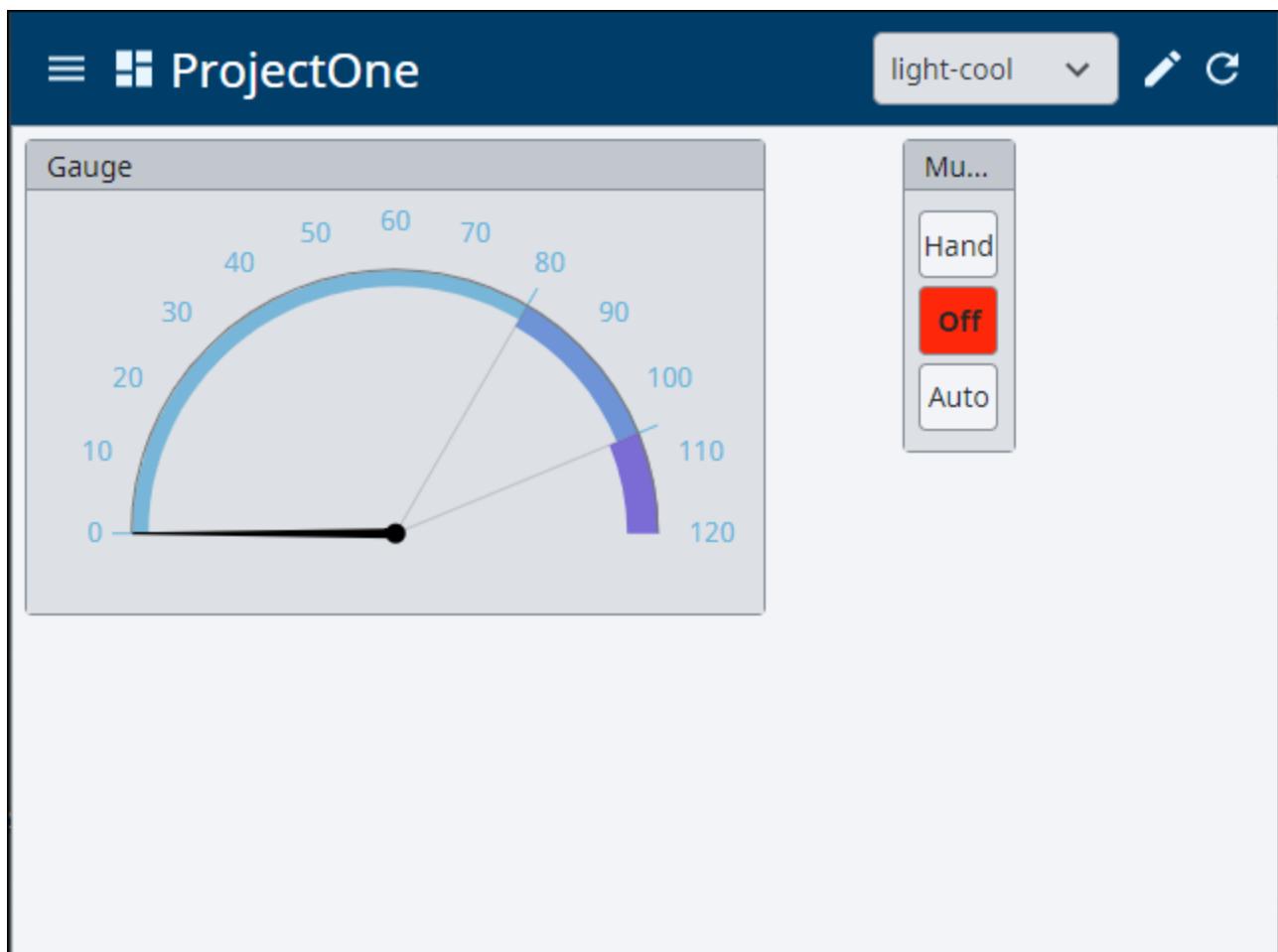
Auto

Multi-State ...

SAVE DELETE

Add Dashboard Reorder admin1

Once you save, your Widget Dashboard navigation screen will be ready to use.



## Vision Project Templates

There are three Vision Project Templates to choose from to help kick start your project: **2-Tier Tab Nav**, **Tab Nav** and **Tree Nav**.

The Vision templates, just like the Perspective templates contain several pre-defined menu objects. These objects can easily be edited by selecting the object in the Project Browser by editing its properties and changing them to anything you want them to be.

The images below show what each of the Vision project templates look like in a Vision Client.

### Tab Nav

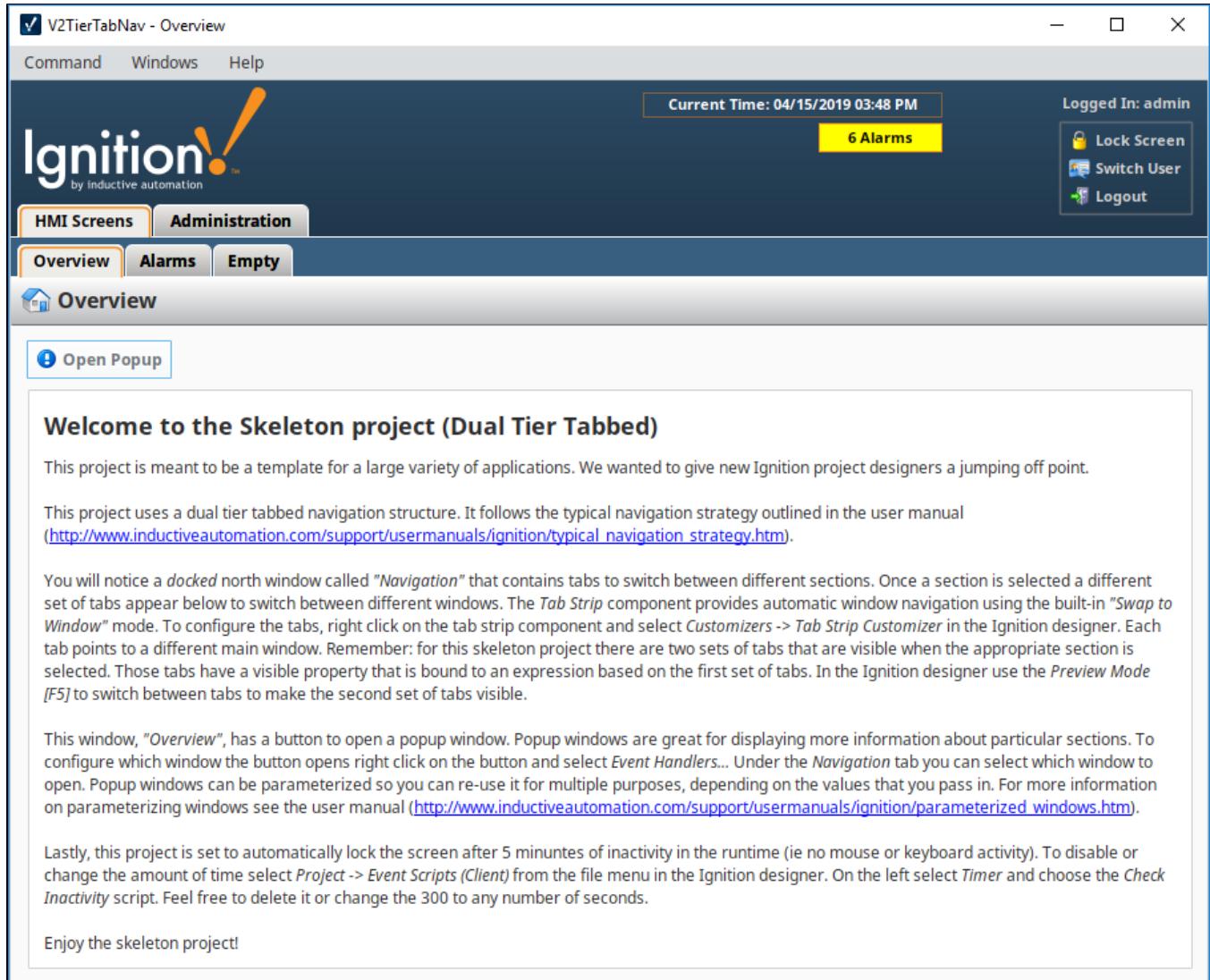
The Tab Nav is good for small size project structures where you only have a few main windows. It allows you to navigate the areas of your project using the tabs. The Tab Nav project template has a docked window that contains tabs that are always open to do navigation, and the main window which fills the rest of the space.

The screenshot shows the Ignition VTabNav - Alarms application window. The top bar includes tabs for Command, Windows, and Help, and displays the current time as 04/15/2019 04:33 PM. A yellow box indicates there are 6 Alarms. The right side shows a user logged in as admin with options to Lock Screen, Switch User, or Logout. The main content area is titled 'Alarms' and contains a table listing 15 alarm entries. The columns are Active Time, Display Path, Current State, and Priority. Most alarms are listed under the 'Active, Unacknowledged' state, while some are Cleared, Unacknowledged. The Priority column shows a mix of High and Low priority levels. At the bottom left are buttons for Acknowledge and Shelve, and at the bottom right are search and filter icons.

| Active Time       | Display Path                                | Current State           | Priority |
|-------------------|---------------------------------------------|-------------------------|----------|
| 4/12/19, 12:22 PM | Turbine Number 200 located at Livermore, CA | Active, Unacknowledged  | High     |
| 4/12/19, 12:22 PM | Turbine Number 100 located at Folsom, CA    | Active, Unacknowledged  | High     |
| 4/12/19, 12:22 PM | Turbine Number 150 located at Folsom, CA    | Active, Unacknowledged  | High     |
| 4/12/19, 12:22 PM | Turbine Number 300 located at Fresno        | Active, Unacknowledged  | High     |
| 4/12/19, 12:22 PM | F Temp/Alarm                                | Active, Unacknowledged  | Low      |
| 4/15/19, 4:31 PM  | VFD Motors/VFD Motor 1/Amps/Below Setpoint  | Active, Unacknowledged  | Low      |
| 4/15/19, 4:29 PM  | VFD Motors/VFD Motor 1/Amps/Below Setpoint  | Cleared, Unacknowledged | Low      |
| 4/15/19, 4:30 PM  | VFD Motors/VFD Motor 1/Amps/Below Setpoint  | Cleared, Unacknowledged | Low      |
| 4/15/19, 4:30 PM  | VFD Motors/VFD Motor 1/Amps/Below Setpoint  | Cleared, Unacknowledged | Low      |
| 4/15/19, 4:31 PM  | VFD Motors/VFD Motor 1/Amps/Below Setpoint  | Cleared, Unacknowledged | Low      |
| 4/12/19, 12:22 PM | Turbine Number 400 located at San Diego     | Cleared, Acknowledged   | High     |
| 4/12/19, 12:22 PM | Turbine Number 10 located at North          | Cleared, Acknowledged   | High     |
| 4/12/19, 12:22 PM | Turbine Number 155 located at Folsom, CA    | Cleared, Acknowledged   | High     |
| 4/12/19, 12:22 PM | Test/Boolean Tag/Above Normal               | Cleared, Acknowledged   | Low      |

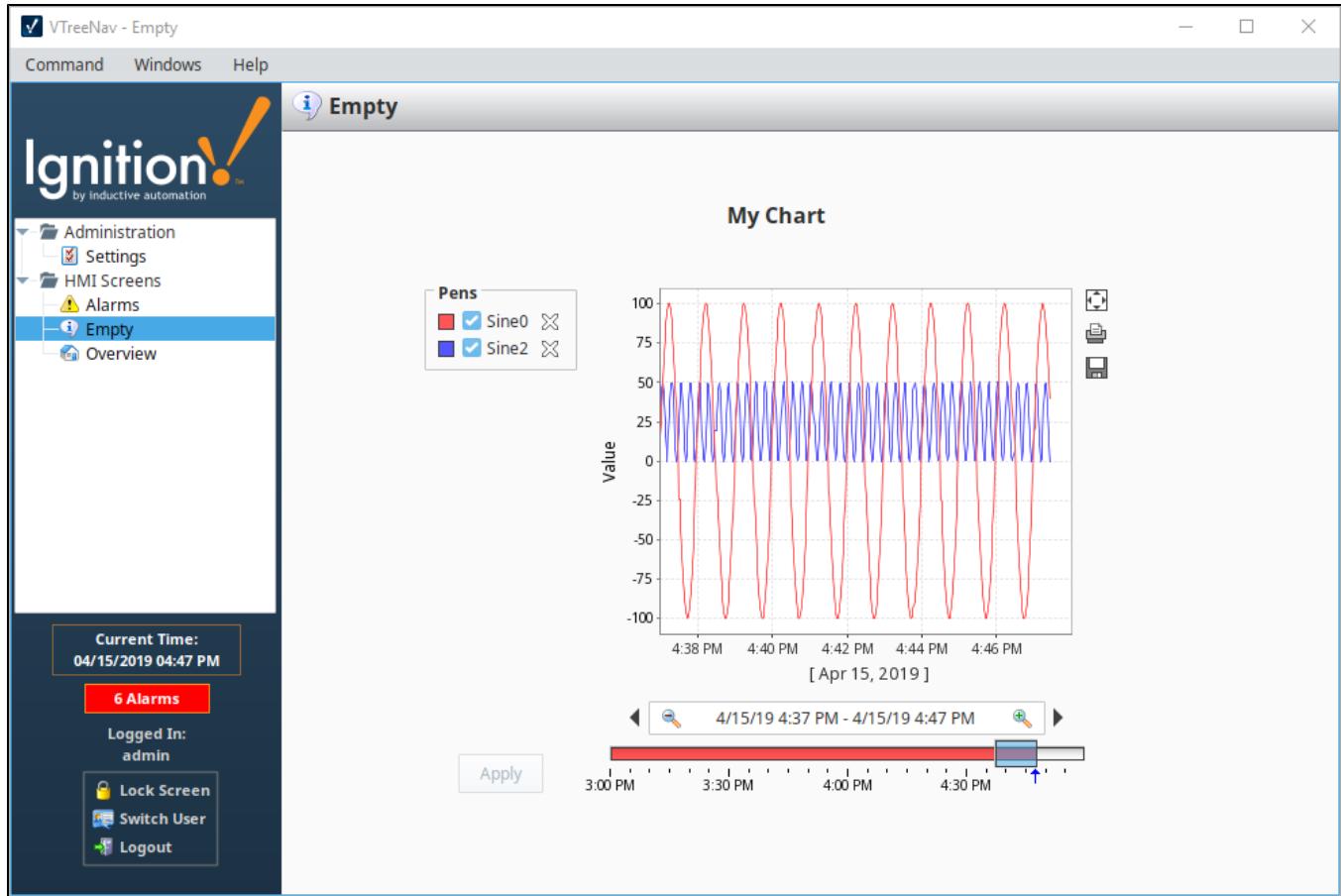
## 2-Tier Tab Nav

2-Tier Tab is good for small and regular size project structures where windows are grouped. The Tab Nav project template is similar to the Tab Nav template only it has a second tier of tabs added. It contains a second level of tabs allowing you to navigate around various areas of your project. The 2-Tier Tab Nav project template has a docked window that contains tabs that show and hide based on selection that are always open to do navigation, and the main window which fills the rest of the space.



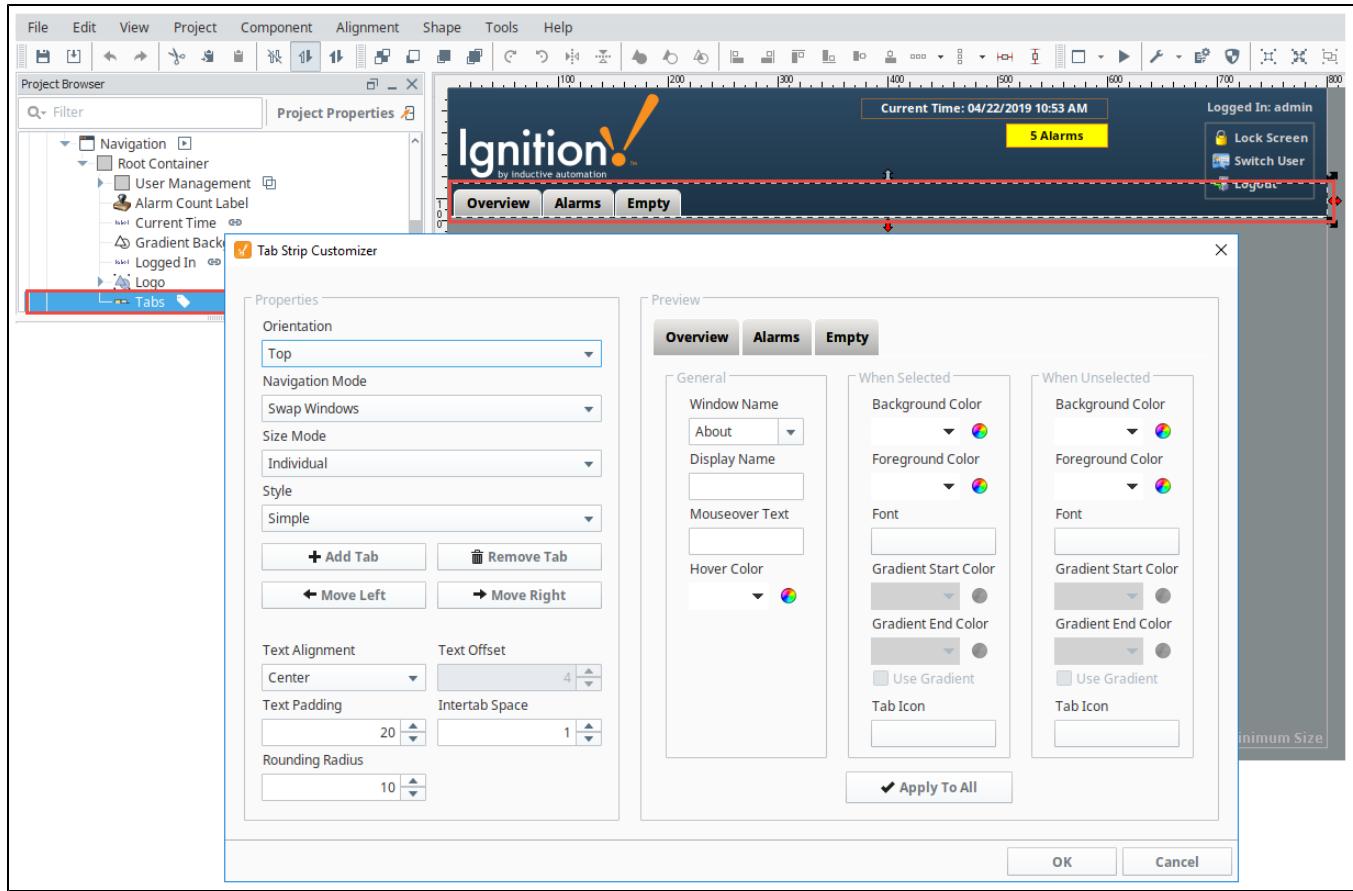
## Tree Nav

The Tree Nav project template is a hierarchical view of groups of information that can be configured to expand submenu branches and menu items and is docked on the left side of the screen. It is great for medium and large project structures because you can view the entire project structure at a glance allowing you to navigate to any structure within the tree view. The tree structure uses folders to group main windows, and can be as many levels deep as you need.



## Adding Windows to the Navigation

To edit the Tab Nav and Tree Nav menus, you just need to edit the properties of the navigation components. You can go to the Navigation window in the Project Browser, select the Tab Strip, and open the Tab Strip Customizer to change the corresponding component props to add, remove, or update the menu items.



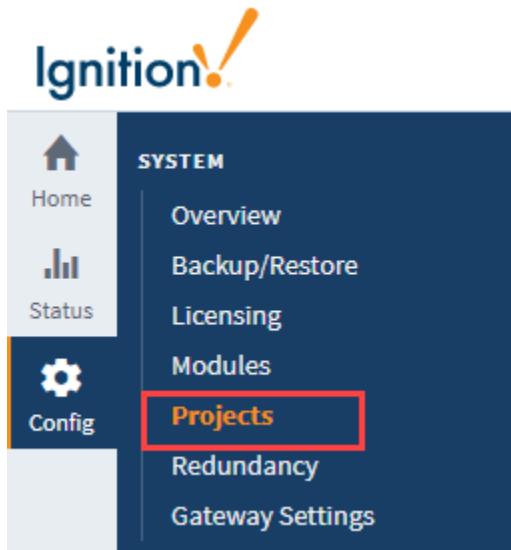
#### Related Topics ...

- [Quick Start Guide](#)
- [Designer](#)
- [Pages in Perspective](#)
- [Navigation Strategies in Vision](#)

# Project Settings

## Project Settings

When you create a new project, the Open/Create Project window captures most of the project settings. See [Creating a Project in the Designer](#). If you want to view or edit your project settings once your project is saved, go to the Config section on the Gateway Webpage and select **System > Projects**.



## On this page ...

- Project Settings
  - Project Settings Table
- Managing Projects
  - Viewing the Details of a Project
  - Editing a Project
  - Deleting a Project
  - Copying a Project
  - Renaming a Project
  - Exporting a Project

Click on the **Edit** to the right of the project name.

The screenshot shows a table titled 'Config > System > Projects'. The table has columns: Name, Description, Enabled, Inheritable, Parent project, and Actions. There are three rows of data:

| Name             | Description             | Enabled | Inheritable | Parent project | Actions                                     |
|------------------|-------------------------|---------|-------------|----------------|---------------------------------------------|
| P_Class_Test_SJP |                         | true    | false       |                | <button>More</button> <button>Edit</button> |
| Parent_Project   |                         | true    | true        |                | <button>More</button> <button>Edit</button> |
| Project_East_A   | East plant test project | true    | false       |                | <button>More</button> <button>Edit</button> |

This opens up the Project Settings page.

The screenshot shows the Ignition Config interface in Trial Mode at 1:49:33. The left sidebar has a dark blue background with white text and icons. It includes sections for SYSTEM (Overview, Backup/Restore, Licensing, Modules, Projects - selected), NETWORKING (Web Server, Gateway Network, Email Settings), SECURITY (Auditing, Users, Roles, Service Security, Identity Providers, Security Levels, Security Zones), DATABASES (Connections, Drivers, Store and Forward), and ALARMING (General, Journal, Notification, On-Call Rosters, Schedules). A search bar at the bottom of the sidebar contains the placeholder 'Search...'. The main content area has a light gray background. At the top, it shows the path: Config > System > Projects > Project\_East\_A - Edit. Below that is a green banner with 'Trial Mode 1:49:33' and a 'Activate Ignition' button. The main form is titled 'Project Settings'. It has several fields: 'Name \*' with 'Project\_East\_A' and a note 'Choose a name to identify this project.'; 'Description' with 'East plant test project'; 'Title' (empty); 'Enabled' with a checked checkbox and a note 'A disabled project will not be active on the Gateway, but will remain editable in the Designer.'; 'Inheritable' with an unchecked checkbox and a note 'Inheritable projects are not runnable as a stand-alone project, but are intended to provide shared resources to one or more child projects.'; 'Parent Project' with a dropdown menu set to 'Project\_West\_Templates'; and a 'Connections' section with three dropdown menus: 'User Source' (default), 'Default Database' (DB), and 'Default Tag Provider' (default).

## Project Settings Table

| Project Settings |                                                                                                                                                                                                                                                                               |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Property         | Description                                                                                                                                                                                                                                                                   |
| Name             | Name of the project (read only).                                                                                                                                                                                                                                              |
| Description      | Brief description of the project (optional). This description can be viewed on the Open/Create Project screen when you hover over the <b>Information</b> icon.                                                                                                                |
| Title            | Title for the project (optional). This is the name that will be displayed on the launch page of the Gateway and in the runtime Client or Session. There are no restrictions to special characters or spaces. If no title is specified, the project name will be used instead. |
| Enabled          | A disabled project will not be active on the Gateway, but will remain editable in the Designer.                                                                                                                                                                               |
| Inheritable      | Inheritable projects are not runnable as a stand-alone project, but are intended to provide shared resources to one or more child projects.                                                                                                                                   |
| Parent           | Each project can have a parent project, and will inherit all of the resources of that parent project.                                                                                                                                                                         |

| Project              |                                                                                                                                                                     |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Connections</b>   |                                                                                                                                                                     |
| User Source          | A group of users with their associated roles. Security policies are defined in terms of these roles.                                                                |
| Default Database     | Database to be used for historical data logging, reporting, storing alarm logs, and Tags storage. You can also query existing data and update data in the database. |
| Default Tag Provider | Identifies a Tag database (a collection of Tags) and a name.                                                                                                        |

## Managing Projects

Once you have a project or two (or twenty) setup, you might want to change some of the base settings. You can manage the projects from the Config section of Gateway by going to **System > Projects**. The Projects window displays all your projects. To the right of the project name, click the **More** button, and here you can Edit, Delete, view Details, Copy, Rename or Export your project.

**Note:** You can manage many of these settings in the Designer. See the [Project Properties](#) page for more information.

| Name        | Description | Enabled | Inheritable | Parent project | Actions                                                          |
|-------------|-------------|---------|-------------|----------------|------------------------------------------------------------------|
| Compressor  |             | true    | false       |                | <a href="#">More</a> <a href="#">Edit</a>                        |
| Controller  |             | true    |             |                | <a href="#">Delete</a> <a href="#">More</a> <a href="#">Edit</a> |
| Controller1 |             | true    |             |                | <a href="#">More</a> <a href="#">Edit</a>                        |
| ExportTags  |             | true    |             |                | <a href="#">Copy</a> <a href="#">More</a> <a href="#">Edit</a>   |
| NewProject  |             | true    |             |                | <a href="#">Rename</a> <a href="#">More</a> <a href="#">Edit</a> |
| NewProject1 |             | true    |             |                | <a href="#">Export</a> <a href="#">More</a> <a href="#">Edit</a> |
| NewProject2 |             | true    | false       | global         | <a href="#">More</a> <a href="#">Edit</a>                        |

## Viewing the Details of a Project

To view the project details, go to the Config section of the Gateway webpage, and select **System > Projects**. Find your project, press the **More** button to the right of the project name, and select **Details**. The Details link on the Project window takes you to the Project details for '**<Project Name>**' page where you can choose to view the [Project Settings](#).

## Editing a Project

To edit some of the project settings, go to the Config section of Gateway, and then to **System > Projects**. You will see a list of all your projects. Click **Edit** to the right of project name in the list. The Project - Edit page is displayed. You can now change some of the project settings such as project Description, Title, Enabled, etc. You can also change connections to the User Source, Default Database, and Default Tag Provider.

### Caution: Recommend Changing the Title, not the Project Name

It is not advisable to change the Project Name after it's been created, instead, change the Title property if you want to change how the project appears. Shortcuts that refer to the project will no longer work if the project name is changed.

Many of these settings can be modified in the Designer too, but it is important to note that you cannot change any of these project settings from the Gateway if the project is currently open in a Designer.

## Deleting a Project

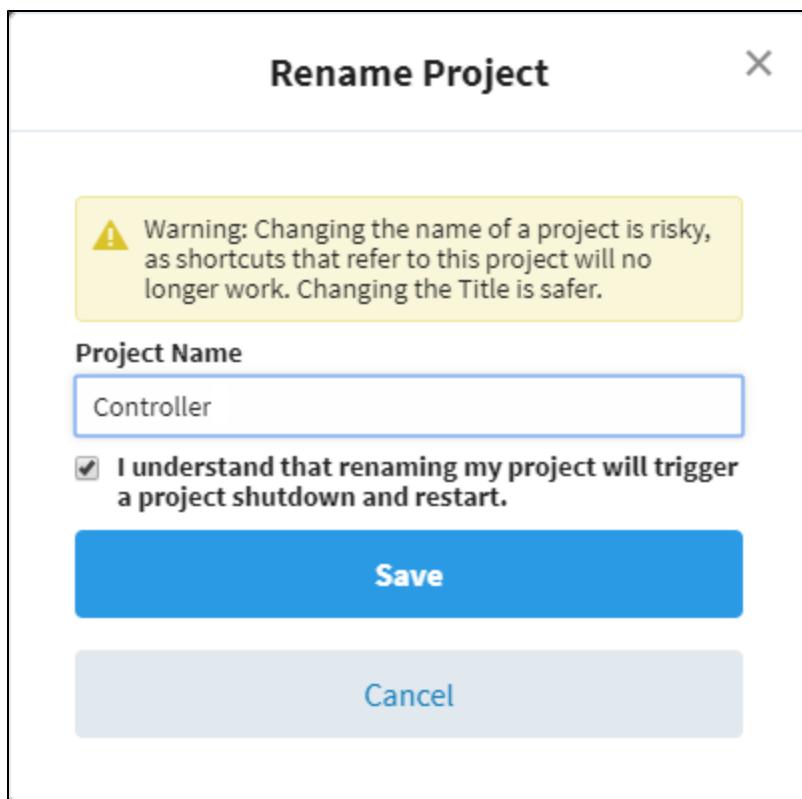
Be aware that once you delete a project, it cannot be undone, a deleted project is gone forever (unless it can be recovered from a [project export](#), [Gateway backup](#) or a [Gateway scheduled backup](#)). Always make a [project export](#) or [Gateway Backup](#) before deleting a project. To delete a project, go to the Config section of Gateway, and then to **System > Projects**. You will now see a list of all your projects. To the right of the project name in the list, look for **Delete** and click on it. This deletes your project.

## Copying a Project

Copying your project is useful when you need a *snapshot* of a project before starting major changes, or for creating a starting point for a new project based on an old one. To copy a project, go to the Config section of Gateway, and then to **System > Projects**. You will now see a list of all your projects. To the right of the project name in the list, click **Copy**. This creates a copy of your project.

## Renaming a Project

Changing the name of a project is risky. Shortcuts that refer to the project will no longer work. It is advisable to change the Title which is much safer. If you decide to rename a project, go to the Config section of Gateway and then to **System > Projects**. To the right of the project name in the list, click **Rename**. This will open a Rename Project window. Read it carefully, and if you want to proceed, enter a new project name, mark the checkbox acknowledging that the project will shutdown and restart, then click **Save**.



**Note:** Renaming a project triggers a project shutdown and restart.

## Exporting a Project

Project Export is a project backup. It takes less time than a Gateway backup and it's smaller. This exports your project as a **.zip** file. Once you have an exported file of your project, you can take it to any other Gateway and merge it in with other projects. Refer to the [Project Export and Import](#) page to learn exactly what is included in a project export.

Related Topics ...

- [Project Properties](#)

- Project Export and Import

# Ignition Redundancy

Ignition redundancy supports a 2-node system, meaning there are two copies of the Gateway running. One node is the Master Gateway and the other is the Backup Gateway or backup node. All projects, Gateway settings, etc., are shared between nodes. The master node manages the configuration then replicates it to the backup node.

The screenshot shows the Ignition Gateway Status Overview page. In the top right corner, under the 'Redundancy' section, it says 'Redundancy' with a status of 'Active, Connected'. Below this, the 'Gateway Network' section shows 1 active connection and 2 remote gateways. The 'Systems' section provides performance metrics like CPU usage (8% CPU | 320mb), redundancy status (Active, Connected), and module counts (25 installed, 120 total). The 'Connections' section lists various network components: Designer Sessions (1 open), Databases (0/8 connected), OPC Connections (1/1 connected), Store & Forward (0 stores quarantined), Devices (1 enabled), and Vision Clients (0 open).

## On this page ...

- Node Communication
- Configuration Synchronization
- Runtime State Synchronization
- Status Monitoring
- System Activity
- Historical Logging
- Client Failover
  - Vision Clients
  - Perspective Sessions



## How Redundancy Works

[Watch the Video](#)



## Updating or Patching a Redundant Ignition Pair

Learn about updating redundant servers and how to make the process a success.

[Link to Knowledge Base Article](#)

When you have redundant systems in place, you can get detailed status information by going to Gateway webpage and selecting **Status > Redundancy** to view the system's status and events.

## Node Communication

The master and backup nodes communicate over TCP/IP. Therefore, they must be able to see each other over the network, through any firewalls that might be in place. All communication goes from the backup to the master node over the gateway network (default **port 8088** without SSL, **port 8060** with SSL). Therefore, that port must allow TCP listening on the master machine.

## Configuration Synchronization

The master node maintains the official version of the system configuration. You must make all changes to the system on the master Gateway, the backup Gateway does not allow you to edit properties. Similarly, the Designer only connects to the master node.

When changes are made on the master, they are queued up to be sent to the backup node. When the backup connects, it retrieves these updates, or downloads a full system backup if it is too far out of date.

If the master node has modules that aren't present on the backup, they are sent across. Both types of backup transfers, **data only** and **full**, will trigger the Gateway to perform a soft reboot.

## Runtime State Synchronization

Information that is only relevant to the running state, such as current alarm states, is shared between nodes on a differential basis so that the backup can take over with the same state that the master had.

On first connection or if the backup node falls too far out of sync, a full state transfer is performed. This information is light-weight and does not trigger a Gateway restart.

## Status Monitoring

Once connected, the nodes begin monitoring each other for liveness and configuration changes. While the master is up, the backup runs according to the **stand by activity level** in the settings.

When the master cannot be contacted by the backup for the specified amount of time, it is determined to be down and the backup assumes responsibility. When the master becomes available again, responsibility is dictated by the recovery mode and the master either takes over immediately or waits for user interaction.

## System Activity

When a node is active, it runs fully, connecting to any configured OPC servers, and communicating with devices. When it is not active, its activity level is dictated by the settings, either **warm** or **cold**.

- In **warm** standby, the system runs as if it were active, with the exception of logging data or writing to devices, allowing for faster fail-over.
- In **cold** standby, the system connects to all OPC servers but does not subscribe to Tag values. The Ignition OPC UA server does not communicate with any device, but third party OPC UA servers may still have device connections. This allows the system to standby without putting additional load on the devices and network. Failover takes slightly longer, as Tags must be subscribed and initialized.

## Historical Logging

Historical data presents a unique challenge when working with redundancy because it is never possible for the backup node to know whether the master is truly down or simply unreachable. If the master was running, but unreachable due to a network failure, the backup node becomes active and begins to log history at the same time as the master, who is still active.

In some cases this is OK because the immediate availability of the data is more important than the fact that duplicate entries are logged. But in other cases, it's desirable to avoid duplicates, even at the cost of not having the data available until information about the master state is available.

Ignition redundancy provides for both of these cases, with the **backup history level**, which can be either **Partial** or **Full**.

- In **Full** mode, the backup node logs data directly to the database.
- In **Partial** mode, however, all historical data is cached until a connection is reestablished with the master. At that time, the backup and master communicate about the uptime of the master, and only the data that was collected while the master was truly down is forwarded to the database.

## Client Failover

### Vision Clients

All Vision clients connect to the active node. When this system fails and is no longer available, they automatically re-target to the other node. The reconnection and session establishment procedures are handled automatically, but the user is notified that they have been transferred to a different node so that they can notify the system administrator that the system may need attention.

### Perspective Sessions

Like Vision clients, Perspective sessions connect to the active node. When connection to the active node is lost, or the activity level of the Gateway changes from **active**, the session will simultaneously attempt to:

1. Re-establish the connection to the Gateway it was connected to, and check to make sure its activity level is **active**.
2. Monitor the backup Gateway. If the backup Gateway becomes reachable and **active** before the connection to the active Gateway can be re-established, the Perspective session navigates in the browser to the same project and page on the backup Gateway.

[In This Section ...](#)

# Setting Up Redundancy

In redundancy, both nodes will share the exact same configuration state. When a Backup node connects to a Master node, the Backup will attempt to synchronize itself with the Master. Therefore, before you set up for redundancy the following should be considered:

## 1. Start with a fresh install for the Backup node.

Because the current configuration of the Backup node will be overwritten, make sure that it does not contain anything valuable. It is a good idea to export any projects that are unique to the Backup before enabling redundancy.

## 2. All system configurations relative to the Master node must also resolve on the Backup node.

For example, OPC UA connections and database connections must use addresses that resolve from both nodes, or any OPC-COM servers must be installed and configured identically on both nodes. This means using "localhost" in any of the database connections won't work. You should use the IP address of the computer instead.

## 3. Configure firewalls between the redundancy nodes.

Redundant systems need TCP connectivity between each other on the default Gateway network ports. Turning off software firewalls or adding special exception rules for each others' addresses is required. The default Gateway Network port is **port 8088** (without SSL), and **port 8060** (with SSL), and the Backup node must be able to send outgoing data on that port. The port can be changed from Gateway Network settings.

**Note:** Two [Edge Gateways](#) can be set up with redundancy. An Edge Gateway can only failover to another Edge Gateway (not a standard Ignition Gateway). Also, an Edge Gateway cannot be used as backup to a Standard Ignition Gateway.

### Note:

While the OS platform (i.e., Windows, OS X, Linux) for the Master and Backup can differ, it is recommended to have similar OS platforms. If the OS platforms do differ, the Windows machine should be the master system or else the Force Failover option will not work.

However, different versions of the same operating system such as Windows 10 and Windows 8 or OSX 10 and OSX 11 have full functionality.

## On this page ...

- [On the Master Gateway](#)
- [On the Backup Gateway](#)
- [On the Master Gateway](#)
- [Redundancy Settings](#)
- [Troubleshooting](#)
  - [Redundancy Connectivity](#)
  - [Advanced Troubleshooting](#)



INDUCTIVE  
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## Setting Up Redundancy

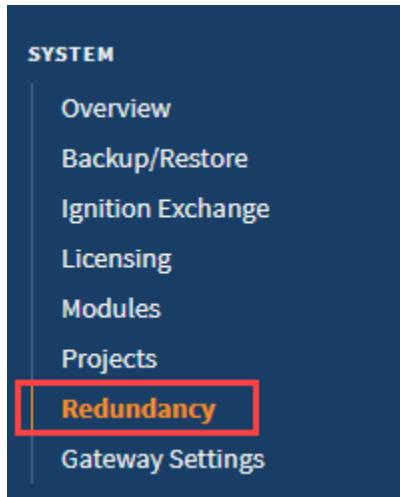
[Watch the Video](#)

## On the Master Gateway

### 1. Go to the [Config](#) section of the Master Gateway Webpage.

### 2. Select [System > Redundancy](#).

The Redundancy and Network Configuration page is displayed showing different sections and settings. See the table below for a description of all settings.



3. Change the following settings:
- UnderRedundancy Settings, set Mode to **Master**.
  - Optionally, configure any desired settings underMaster Node Settings.

| Redundancy Settings          |                                                                                                                                                                                                                                                                                      |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mode                         | <input type="button" value="Master"/><br>Independent<br>Backup<br><b>Master</b> <span style="background-color: #ffffcc; border: 1px solid #ccc; padding: 2px;"> </span>                                                                                                              |
| Standby Activity Level       | <input type="button" value="Cold"/><br>How the node should run when it is not currently the active node. If <code>cold</code> , the node will perform minimal operations until it becomes active. If <code>warm</code> , the node will run at a high level, reducing failover times. |
| Failover Timeout             | <input type="text" value="10000"/> <span style="font-size: small;">[<input ]<="" span="" type="button" value="..."/><br/>           The time of inactivity, in milliseconds, before the backup assumes responsibility.<br/>           (default: 10000)         </span>               |
| Startup Connection Allowance | <input type="text" value="30000"/><br>The time in milliseconds that the system will wait at startup for a connection before making a decision on the node's responsibility level.<br>(default: 30000)                                                                                |

4. Click **Save Changes**. The Confirm change to Redundancy Settings page is displayed.

**Confirm Change to Redundancy Settings**

Altering redundancy settings can potentially have a large impact on the system, and may require a restart. Are you sure you want to continue?

**Confirm**

**Cancel**

5. Click **Confirm** to apply your settings.  
 6. Go to the Config tab and select **System > Redundancy** to ensure the redundancy mode and state is properly set.

## On the Backup Gateway

Do the exact same steps 1-6 above on the Backup Gateway Webpage, except replace step 3 with the following:

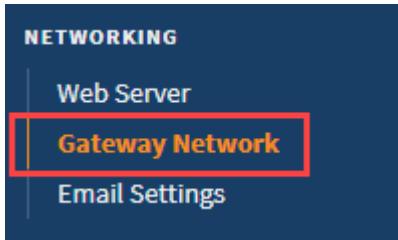
- Under Redundancy Settings, set **Mode to Backup**.
- Under Backup Node Settings, configure the Master Node Address and Port to point to the Master Gateway. The Master Node address should be a hostname or IP address. The Port setting (assuming default configurations) should be **8060** if using SSL,

otherwise **8088**.

The screenshot shows the 'Redundancy Settings' configuration page. The 'Mode' dropdown is set to 'Backup', which is highlighted with a red box. Other options in the dropdown are 'Master', 'Independent', and 'Master'. Below the dropdown, there is a note: 'Only one master node can run this node's role. There should be one master and one backup. Selecting independent turns off redundancy.' The 'Standby Activity Level' is set to 'Cold'. The 'Failover Timeout' is set to '10000'. The 'Startup Connection Allowance' is set to '30000'.

## On the Master Gateway

1. Return to the Config section of the Master Gateway Webpage.
2. Select **Networking > Gateway Network**.



3. Navigate to the Incoming Connections tab. You should see a new incoming connection from the Backup Gateway. Find the connection, select **More**.
4. Select **approve**.

The screenshot shows the 'Incoming Connections' tab of the 'Gateway Network Settings' page. It lists a new incoming connection from the Backup Gateway. The connection details are: Common Name: TR-0690157-SB:8060, Serial: 699404284521096990, Issuer: Self, Status: Approved. There are 'deny' and 'delete' buttons next to it. Below this, there is a table with columns: Id, Security, Certificate, Gateway Name, Redundancy Role, and Status. One row shows: ignition-tr-0690157-sb [be44105d-, PendingApproval, N/A, Unknown, Unknown, Unknown. There are 'More' and 'reset' buttons next to it. At the bottom right of the table area, there is an 'approve' button highlighted with a red box, and a 'delete' button below it.

5. To verify the redundancy setup, that is, to ensure the Master and the Backup Gateways are connected, go the Status tab of the Gateway Webpage and click on **System > Redundancy**. The Redundancy page will show the connected nodes and their current states.

After approving the connection, the Backup connects to the Master and downloads a system backup, then restarts. Once the restart is complete, the Backup node is synchronized and in communication with the Master.

## Redundancy Settings

All redundancy settings are configured in the Gateway Webpage under the Config tab, **Systems > Redundancy**. Most settings are used by both the Master and Backup nodes, with their individual settings broken out into separate categories.

It is important to know that while the full system configuration is shared between nodes, redundancy settings are not shared between nodes. Therefore, it is perfectly acceptable to have different values for the same settings on the two nodes. For example, it is possible to have a different Standby Activity Level on both nodes, and, of course, the network settings will often be different.

**Note:** The Master node shares all configuration with the Backup node, and this means that changes cannot be made to your project from the Backup. In fact, the Designer can never be opened from a Backup node, even if the Master is currently offline.

| Redundancy Settings          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mode                         | <p>Enable or disable redundancy, and specify this node's role. There should be one master and one backup node per redundant pair. Independent turns off redundancy.</p> <p><b>Independent</b> - Redundancy is not enabled and this Ignition system runs as an independent node.</p> <p><b>Master</b> - This is the Master node, who listens for a connection from the Backup node, and is in charge of managing system synchronization.</p> <p><b>Backup</b> - This is the Backup node, who will connect to the Master and receive system updates.</p>                                                                                                                                                                                                           |
| Standby Activity Level       | <p>How the node should run when it is not currently the <b>Active</b> node.</p> <p><b>Cold</b> - The node performs minimal operations until it becomes active. The purpose is to minimize the load on the network and on devices.</p> <p><b>Warm</b> - The node runs at a high level, reducing failover times.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Failover Timeout             | The time of inactivity, in milliseconds, before the backup assumes responsibility.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Startup Connection Allowance | <p>The time in milliseconds that the system will wait at startup for a connection before making a decision on the node's responsibility level. This is used to prevent unnecessary switch over caused by a node starting as active, only to connect and find that the other node is active, resulting in one of the nodes being deactivated.</p> <p><b>Note:</b></p> <p>It is important to notice that this setting can interfere with the Master Recovery mode:</p> <ul style="list-style-type: none"><li>• If the Master is active, it will always request the Backup to de-activate.</li><li>• If this setting is low, or 0, the Master will always become active before connecting to the Backup, and thus "manual recovery" will not be possible.</li></ul> |

| Network Settings              |                                                                                                                                                                                                                                                                                      |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Auto Detect Network Interface | If true, the system will automatically select which network interface to use. Most commonly disabled on systems with multiple network cards, in order to explicitly specify which interface to use. If false, the system will bind itself to the interface of the specified address. |
| Network Bind Interface        | The IP address of the network interface to use for redundancy. Only used if "Auto Detect" is false.                                                                                                                                                                                  |

| Master Node Settings |                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Recovery Mode        | <p>How the Master node resumes responsibility after starting again.</p> <p>Automatic - The Master automatically takes back responsibility, and becomes active. The Backup node goes to standby.</p> <p>Manual - The Backup node is allowed to stay active. The Master will become active if the Backup node fails, or if the user requests a switchover from the Gateway configuration page.</p> |
|                      |                                                                                                                                                                                                                                                                                                                                                                                                  |

|                            |                                                                                                                                                                                                                                                                                                           |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Runtime Update Buffer Size | How many "runtime state" updates can be queued in memory before the system stops tracking and a full transfer is performed. These updates represent information that the other node should have in order to have the same running state as the Master when it's forced to take over.                      |
|                            | This is most often the values of static Tags and the current alarm state. Given that the update buffer is only used once the nodes are connected, the default value is usually fine, and only needs to be increased on systems that may have many alarms that change together, or many static Tag writes. |
| Config Update Queue Size   | The maximum size (in megabytes) of config updates allowed before a full transfer is performed.                                                                                                                                                                                                            |

| Backup Node Settings |                                                                                                                                                                                                                                                                                                      |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Master Node Address  | The address of the Master Ignition system.                                                                                                                                                                                                                                                           |
| Port                 | The Gateway Network port used by the Master to listen on. For the Backup, the port to connect to on the Master.                                                                                                                                                                                      |
| Use SSL              | Use SSL to connect to the remote machine.                                                                                                                                                                                                                                                            |
| Ping Rate            | How often, in milliseconds, to send a message from the Backup to the Master.                                                                                                                                                                                                                         |
| Ping Timeout         | The maximum time, in milliseconds, allowed for a ping response. Pings that time out are counted as missed pings.                                                                                                                                                                                     |
| Ping Max Missed      | The amount of missed pings that will force the connection to the master to be considered faulted.                                                                                                                                                                                                    |
| Websocket Timeout    | The maximum time, in milliseconds, allowed for a new web socket to connect to the Master.                                                                                                                                                                                                            |
| HTTP Connect Timeout | The maximum time, in milliseconds, allowed to establish an HTTP connection to the Master.                                                                                                                                                                                                            |
| HTTP Read Timeout    | The maximum time, in milliseconds, allowed to read or send HTTP data to the Master.                                                                                                                                                                                                                  |
| History Mode         | How history is treated by the Backup system. If <b>Full</b> , history will be stored normally, as it would be on the Master system. If <b>Partial</b> , history will be cached until the Master is available again and the Backup node is able to determine the exact time that the Master was down. |

## Troubleshooting

### Redundancy Connectivity

When the two redundant nodes are connected, you will be able to see their state details in the [Status](#) section of the Gateway Webpage. There are also various other places where the redundancy state is shown as **connected**.

If the two nodes cannot connect, check the following:

- Verify that the Master address is correct in the Backup. Try to ping the Master machine from the Backup machine, and verify that you're using the correct address for the network card that the Master is connected through.
- If using system names (or domain names), verify that the name is resolving to the correct address by performing a ping.
- Verify that the firewall on the Master is set to allow TCP traffic to the designated port.
- Verify that the Backup is not connecting and then immediately disconnected for some reason.
- Viewing the error log in the Gateway console section should show this. If errors are occurring at regular intervals, look at the message for an indication of what is happening. An example of a potential problem is when the failover time is set too low for the given network, which results in many socket read timeout exceptions, which in turn leads to many disconnect/reconnect attempts.
- If errors are occurring, but the cause isn't clear, contact [Inductive Automation Support](#).

### Advanced Troubleshooting

A variety of loggers can be found under the Gateway console section by going to "Levels" and searching for "Redundancy". By setting these loggers to a finer level, more information will be logged to the console. This is generally only useful under the guidance of Inductive Automation support personnel, though more advanced users may find the additional logged information helpful.

[Related Topics ...](#)

- Database Considerations

# Database Considerations

## Ignition Database Requirements

Given that many parts of the Ignition system interact with the database, it's important to give some thought as to how it will be used when redundancy is turned on, and the different database architectures that are possible.

When evaluating database architectures for use with Ignition, it's important to look carefully at how the system will use the database. Which pieces are critical? Which pieces are "optional" so that the system continues to function while the database is down? Which pieces can operate in "read-only" mode if necessary?

Ignition uses the database for many purposes. Here are some common areas where they are used, and how availability can impact the system:

### Tags

**Tags** rely on the database for Tags that execute queries. These Tags will error out if the database is unavailable, but the status and control functionality of the system will function on the whole.

### History - Tags and Other

All history in Ignition goes through the [Store-and-Forward](#) system, meaning that it will be cached until the database is available. However, while the data is cached, it will be unavailable to view or analyze on the clients. Therefore, when looking at how the database should be set up, it is necessary to determine how crucial rapid-availability of the data is.

### Alarming

The alarm status system does not reside in the database, so it will continue to function if the connection is down. [Alarm Journal](#) information will go through the [Store-and-Forward](#) system as history data.

### Project Screens

Almost all projects use database access for providing information on screens. These queries will error out as long as the database is unavailable. Screens that only use Tags (in an internal provider) will continue to function, so it would be beneficial to make a distinction between status screens and history screens, if a failover database is not used.

## On this page ...

- [Ignition Database Requirements](#)
  - [Tags](#)
  - [History - Tags and Other](#)
  - [Alarming](#)
  - [Project Screens](#)
- [Database Architectures](#)
  - [Single Shared Server](#)
  - [Clustered/Replicated Database Servers](#)
- [Pertinent Settings](#)
  - [Database Connection Settings - Failover Datasource](#)
  - [Clustering Settings - History Mode](#)



## Database Considerations

[Watch the Video](#)

## Database Architectures

### Single Shared Server

A single database server is used. Any Ignition Gateways will use it, so it is expected to be available even when one of the nodes is not. For that reason, it almost always resides externally, on a separate server machine. This arrangement is the easiest to use with Ignition. A single database connection configured on the master will be replicated to the backup, and both nodes will use the connection as necessary.

### Clustered/Replicated Database Servers

There is a wide variety of capabilities supported by the different brands of database servers. To obtain fault-tolerance on the database front, it is usually necessary to have some sort of cluster/replication system in place. However, it can be very import to examine how Ignition is using the databases, and what capabilities the clustering solution provides.

For example, in many replication scenarios, the master database copies data to the backup. The backup can be used for read purposes, but new data inserted will not be replicated back to the master. Therefore, it is possible to have a failover connection to the backup database, so that clients will continue to receive data, but it would be necessary to run in partial history mode, so that the historical data was cached and inserted only to the master database. The failover connection would be set to standard mode, so the primary connection would be used when possible.

In a more complete cluster environment, where writes to either node would be replicated, a sticky failover connection could be used with full history mode.

### Pertinent Settings

When working with various database architectures, there are a few settings in various parts of the system that are important.

## Database Connection Settings - Failover Datasource

Any database connection can have a failover datasource. If the main connection is unavailable, any queries executed on it will pass through to the secondary connection. In this way, a secondary database can be used when the first is not available, and the system will continue to function. It is important to note that everything passed through to the failover will function normally- no special considerations will be made. For example, the system won't cache data for the primary connection, it will forward it to the secondary. In cases where you want to allow reading from the secondary database, but not writing, you can set up another connection directly to the first database, with no failover, and set all of your write operations to use that.

## Clustering Settings - History Mode

The history mode dictates how history will be treated when the node is not active. If partial, the data will be cached, and only forwarded when the master node is available. This mode can be used to prevent data from being inserted into a backup database in some cases. This setting can be found on the **Redundancy** page under the [Config](#) section of the Gateway.

Related Topics ...

- [Redundant Licensing](#)
- [Setting Up Redundancy](#)

# Redundant Licensing

## Types of Redundant Licensing

When working with Redundancy, both nodes will require a license. However, there are two approaches that are detailed below. In both cases, the license for the Backup node generally contains most, if not all, the same modules as the Master node. For example, if the Master is storing history with the SQL Bridge module, then the Backup would also require the module in the event a failover occurs, otherwise, data would be lost.

However, non-critical modules do not need to be added to the Backup License. The Master license could make use of the Symbol Factory module, and since the Designer only connects to the Master node, there is no reason to add this module to the Backup node.

## On this page ...

- Types of Redundant Licensing
  - Two Standard Licenses - Classic Redundancy
  - Backup-Only Licenses

### Two Standard Licenses - Classic Redundancy

Traditionally, Redundancy involves two standard licenses: one license will be applied to the Master Gateway, and the other license will be applied to the Backup Gateway. Since two standard licenses are being used, this approach allows users to disable Redundancy, and set both Gateways to independent modes.

### Backup-Only Licenses

Backup-Only licenses are available for purchase. This license forces the Gateway into a Backup mode, and the mode can not be changed while the license is applied. The benefit of this type of license is that they come at a discounted price. For more details, contact your Account Representative.



### Redundant Licensing

[Watch the Video](#)

If using a Backup only license, the Mode property on the Backup Gateway's Redundancy page will look like the image below.

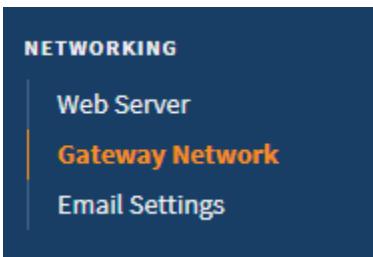
| Redundancy Settings          |                                                                                                                                                                                                                                                                                                                       |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mode                         | <input type="button" value="Backup"/> Enable or disable redundancy, and specify this node's role. There should be one master and one backup node per redundant pair. <input type="button" value="Independent"/> turns off redundancy.                                                                                 |
| Standby Activity Level       | <input type="button" value="Cold"/> How the node should run when it is not currently the active node. If <input type="button" value="cold"/> , the node will perform minimal operations until it becomes active. If <input type="button" value="warm"/> , the node will run at a high level, reducing failover times. |
| Failover Timeout             | <input type="text" value="10000"/> The time of inactivity, in milliseconds, before the backup assumes responsibility. (default: 10000)                                                                                                                                                                                |
| Startup Connection Allowance | <input type="text" value="30000"/> The time in milliseconds that the system will wait at startup for a connection before making a decision on the node's responsibility level. (default: 30000)                                                                                                                       |

Instead of the dropdown list that normally appears on this property, the license forced this Gateway into a Backup mode.

If you would like to change the mode of this Gateway, the backup-only license must first be unactivated. Once unactivated, a new license will need to be applied, otherwise, the Gateway will operate in 2 hour trial mode.

# Gateway Network

The Gateway Network allows you to connect multiple Gateways together over a wide area network, and opens up many distributed features between Gateways.



The Gateway Network provides the following features:

- A dedicated HTTP data channel that can handle multiple streams of message data.
- The ability to set up a node to act as a proxy for another node.
- Security settings that restrict incoming connections based on a white list or on manual approval of the connection. Incoming connections can also be disabled entirely.
- An available SSL mode. When enabled, connections must send SSL certificates to prove their identity. A connection will not be accepted until its SSL certificate is approved.

## Gateway Network Features

The Gateway Network opens up certain services for use that make managing multiple Gateways and having them effectively communicate with each other a snap. It also has special security that can restrict certain services from happening in certain zones of the Gateway Network.

## Enterprise Administration

The [Enterprise Administration Module](#) (EAM) uses the Gateway Network for message and file transfer, and can monitor network connections for availability. The EAM reports whenever communications are lost via alarm events and system Tags.

## Distributed Services

Distributed services included the following:

- Remote Providers: Remote [Realtime](#) and [Historical](#) Tag providers make remotely controlling and storing Tag data even easier.
- Remote Alarming: [Remote Alarming](#) makes notifying all Gateways in the network possible, to quickly and effortlessly track down issues.

## Security Zones and Service Security

[Security Zones](#) can be setup to lock down or prevent access to certain parts of Gateways within the Gateway Network.

## On this page ...

- [Gateway Network Features](#)
  - [Enterprise Administration](#)
  - [Distributed Services](#)
  - [Security Zones and Service Security](#)
- [Outgoing vs. Incoming Connections](#)
  - [Connections and Servers](#)
  - [Which Server Should I Configure the Outgoing Connection On?](#)
  - [General Settings](#)
  - [Main](#)
  - [Security](#)
- [Setting Up a Gateway Network Connection](#)
  - [Main](#)
  - [Ping](#)
  - [Timeouts](#)
  - [Gateway Network Connection Example](#)
- [Deleting Connections](#)
- [Certificates and SSL](#)
  - [Requiring a Certificate](#)
  - [Denying a Certificate](#)
- [Gateway Network Diagnostics](#)
- [Gateway Network Queue Management](#)
  - [Queue Settings](#)



## Gateway Network Overview

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## Outgoing vs. Incoming Connections

When using the Gateway Network, you will be working with two type of connections.

- **Outgoing Connections:** To establish communications, create an outgoing connection on the local machine. The outgoing connection always begins the connection process to a remote machine. After the outgoing connection is created, the local machine will attempt to use the connection to establish communications with the remote machine.
- **Incoming Connections:** On the remote machine, an incoming connection will automatically be created when the new connection attempt is detected. For connections where security settings require manual approval, you will need to approve the incoming connection before it can be used. If no security controls have been set, the incoming connection will automatically accept the connection from the local machine and begin sharing data.

## Connections and Servers

Every machine on the Gateway Network is known as a Server. When you establish a connection to a remote machine, the remote Server sends data about itself and also sends data about any other Servers known to that machine. For example, assume your local machine is GatewayA. The remote

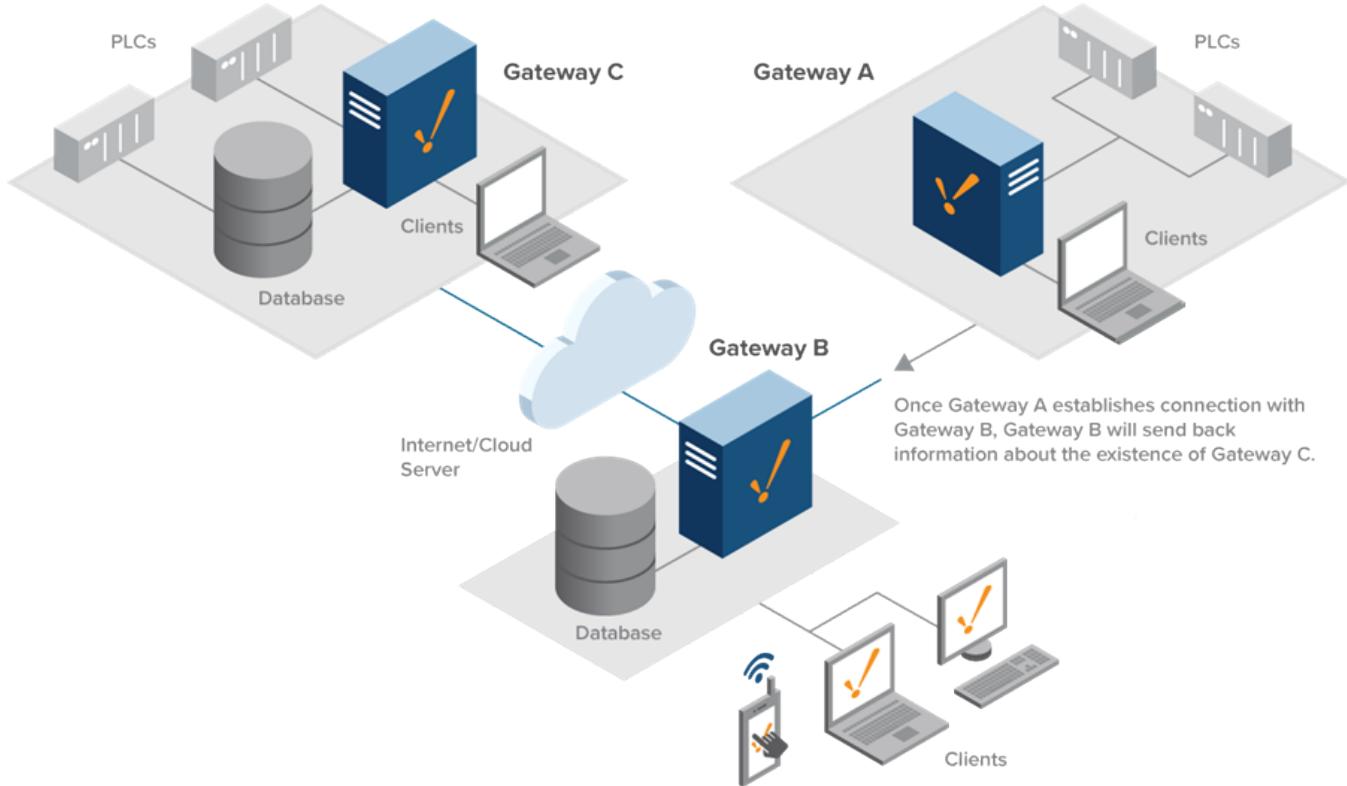
machine is known as GatewayB. GatewayB also knows about another remote machine named GatewayC. As soon as your local GatewayA establishes a connection with GatewayB, GatewayB also sends information about the existence of GatewayC.

Modules such as the Enterprise Administration Module (EAM) are aware of this relationship and allow communication between GatewayA and GatewayC, even though there is no direct connection from the local machine to GatewayC.

If you are cloning Gateways to then be connected via Gateway Network, it is important to notice that there is a Gateway unique identifier in %IgnitionInstallationDirectory%/data/.uuid. No two Gateways connected via Gateway Network should share a .uuid. Generally, Gateways are cloned by restoring the same Gateway backup on multiple servers. Since Gateway backups carry their .uuid with them, restoring the same Gateway on multiple servers will result in multiple Gateways having the same .uuid. To get around this, you must stop your Ignition service, delete %IgnitionInstallationDirectory%/data/.uuid, then start your Ignition service so that a new, unique .uuid is generated. Doing this before connecting two cloned Gateways will prevent any .uuid collisions.

## Which Server Should I Configure the Outgoing Connection On?

In regards to connecting multiple Gateways over the Gateway Network, there is little difference between an Outgoing and Incoming connection: these terms simply indicate which server the connection was configured on, and are mostly ignored by the rest of Ignition. Thus, assuming GatewayA and GatewayB, configuring an outgoing connection from A to B is equivalent to configuring an outgoing connection from B to A. When connecting two Gateways, only a single connection is required between them.



## General Settings

### Main

The Gateway Network General Settings set the basic rules for the system. By default, these settings are lenient to allow for easy setup, but can be set for security.

| Setting | Description                                                                                                                                    |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Enabled | Uncheck this checkbox to disable using the Gateway Network.                                                                                    |
|         | If true, only connections that use SSL to encrypt traffic will be allowed. This setting only applies to incoming connections. Default is true. |

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Require SSL            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Require Two Way Auth   | <p>Enforces two-way SSL authentication. If true, you will need to install the remote machine's certificate on this machine, in addition to manual approval of this machine's certificate on the remote machine.</p> <p>If you check this setting, you will need to provide the remote machine's certificate. To do this, manually export a certificate from the remote machine's metro keystore, located in &lt;installdir&gt;/webserver/metro-keystore. Default keystore password is <b>metro</b>, and the alias is <b>metro-key</b>. Then place the certificate on the local machine, in data/certificates/gateway_network.</p> |
| Send Thread            | The maximum number of threads that will be used to upload messages. Applies to outgoing connections. Default is 5.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Send Buffer Limit      | The number of outstanding messages that can be waiting for acknowledgement at a time. Default is 5.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Receive Threads        | The maximum number of threads that will be used to download messages. Applies to outgoing connections. Default is 5.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Processing Queue Limit | Number of received messages that can be held until they are processed by the local system. When this capacity is exceeded, new messages are rejected and errors are reported to the remote Gateway. Applies to incoming connections.                                                                                                                                                                                                                                                                                                                                                                                              |
| Websocket Idle Timeout | <p>This feature is new in Ignition version <b>8.1.3</b><br/> <a href="#">Click here</a> to check out the other new features</p> <p>The maximum number of milliseconds that a websocket is allowed to remain idle before it is closed. This value should always be set higher than outgoing connection ping rates to avoid premature connection termination.</p>                                                                                                                                                                                                                                                                   |

## Security

By default, the security level for incoming connections is set to "Unrestricted", meaning that every remote machine that attempts to connect to the local machine will be accepted without question. You have several options to control security from the Gateway Network settings.

**Note:** These settings are independent of SSL mode, which is detailed below. To change security settings, go to the Gateway Webpage and navigate to **Config -> Networking -> Gateway Network** and select the **General Settings** tab.

| Setting                    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Allow Incoming Connections | If false, only outward connections defined on this gateway will be allowed. Uncheck this checkbox to disable all remote machines from being able to establish an incoming connection. To establish any connections with remote machines, you will need to create outgoing connections from this machine. Default is true.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Connection Policy          | Dictates what connections are allowed. Options as follows: <ul style="list-style-type: none"> <li><b>Unrestricted</b> - Default mode, allows all incoming connections unless the Allow Incoming Connections checkbox is unchecked.</li> <li><b>ApprovedOnly</b> - Incoming connections are created, but cannot be used to send or receive data until you approve the connection under Gateway Network -&gt; Incoming Connections tab. To approve an incoming connection, click the Approve link on the right side of the connection. You can also deny a previously approved connection by clicking the deny link. The approve and deny links will appear next to a connection only if you have enabled the ApprovedOnly setting.</li> <li><b>SpecifiedList</b> - An incoming connection will only be allowed if its server name is on this list. Separate server names with a comma.</li> </ul> |
| Specified List             | Connections with a Gateway Name in this list are automatically allowed if the security mode is set to SpecifiedList. Separate Gateway names with a comma.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Allow Proxying             | If enabled, this Gateway will be allowed to act as a proxy, and forward requests between Gateways that do not have direct connections. Default is false.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## Setting Up a Gateway Network Connection

When you create a new outgoing Gateway Network connection, you need to specify the address for the remote server. There are also settings for ping rates and timeouts. The defaults can be used for these fields. The following are all the available settings for setting up an outgoing Gateway Network.

## Main

| Main    |                                                                                                  |
|---------|--------------------------------------------------------------------------------------------------|
| Host    | <input type="text"/> The address of the remote server, not including the port.                   |
| Port    | <input type="text" value="8060"/> The port of the remote server.<br>(default: 8,060)             |
| Enabled | <input checked="" type="checkbox"/> (default: true)                                              |
| Use SSL | <input checked="" type="checkbox"/> Use SSL to connect to the remote machine.<br>(default: true) |

| Setting | Description                                                                |
|---------|----------------------------------------------------------------------------|
| Host    | The address of the remote server, not including the port. Example: 1.2.3.4 |
| Port    | The port of the remote server. Default is 8060.                            |
| Enabled | Whether this connection is enabled. Default is true.                       |
| Use SSL | Use SSL to connect to the remote machine. Default is true.                 |

## Ping

| Ping         |                                                                                                                                                                     |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ping Rate    | <input type="text" value="1000"/> How often, in milliseconds, to send a ping to a remote machine.<br>(default: 1,000)                                               |
| Ping Timeout | <input type="text" value="300"/> The maximum time, in milliseconds, allowed for a ping response. Pings that time out are counted as missed pings.<br>(default: 300) |
| Missed Pings | <input type="text" value="30"/> The amount of missed pings that will force the connection to be considered faulted.<br>(default: 30)                                |

| Setting      | Description                                                                                                                      |
|--------------|----------------------------------------------------------------------------------------------------------------------------------|
| Ping Rate    | How often, in milliseconds, to send a ping to a remote machine. Default is 1,000.                                                |
| Ping Timeout | The maximum time, in milliseconds, allowed for a ping response. Pings that time out are counted as missed pings. Default is 300. |
| Missed Pings | The amount of missed pings that will force the connection to be considered faulted. Default is 30.                               |

## Timeouts

| Timeouts                  |                                                                                                                                                         |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Websocket Connect Timeout | <input type="text" value="10000"/> The maximum time, in milliseconds, allowed for a new web socket to connect to a remote machine.<br>(default: 10,000) |
| Http Connect Timeout      | <input type="text" value="10000"/> The maximum time, in milliseconds, allowed to establish an HTTP connection to a remote machine.<br>(default: 10,000) |
| HTTP Read Timeout         | <input type="text" value="60000"/> The maximum time, in milliseconds, allowed to read or send HTTP data to a remote machine.<br>(default: 60,000)       |

| Setting                   | Description                                                                                                        |
|---------------------------|--------------------------------------------------------------------------------------------------------------------|
| Websocket Connect Timeout | The maximum time, in milliseconds, allowed for a new web socket to connect to a remote machine. Default is 10,000. |
| HTTP Connect Timeout      | The maximum time, in milliseconds, allowed to establish an HTTP connection to a remote machine. Default is 10,000. |
| HTTP Read Timeout         | The maximum time, in milliseconds, allowed to read or send HTTP data to a remote machine. Default is 60,000.       |



## Setting up a Gateway Network Connection

[Watch the Video](#)

## Gateway Network Connection Example

To establish a basic communication link between two Gateways, first log into the Gateway where you want to establish the outgoing connection. For this example, we use an SSL connection.

1. On the Gateway Webpage, navigate to **Config -> Networking -> Gateway Network**.
2. Click on the **Outgoing Connections** tab. Click the **Create new Outgoing Gateway Connection** link.

The screenshot shows the Ignition configuration interface. The left sidebar has sections for SYSTEM, NETWORKING, and SECURITY. Under NETWORKING, 'Gateway Network' is selected. The main panel shows 'Gateway Network Settings' with tabs for General Settings, Outgoing Connections (which is active and highlighted with a red box), Incoming Connections, Diagnostics, and Queue Management. Below the tabs is a table with columns Host, Port, Enabled, Gateway Name, Redundancy Role, and Status. One row is present: Host 10.10.65.49, Port 8060, Enabled true, Gateway Name Gateway B, Redundancy Role Independent, Status Running. At the bottom is a button labeled 'Create new Outgoing Gateway Connection...' with a red box around it.

3. In the **Host** field, enter the network address of the remote server.
4. In the **Port** field, enter the SSL port used by the remote server. By default, this is set to **8060** (which is defined /data/gateway.xml).

**Note:** This port is different from the default SSL port an Ignition Gateway would use when communicating to a client (default port 8043).

5. Check the **Use SSL** checkbox.

The screenshot shows the 'Main' configuration section of the Ignition configuration interface. The left sidebar shows 'Gateway Network' selected under NETWORKING. The main panel shows fields for Host (http://10.10.110.52) and Port (8088). There is a 'Enabled' checkbox which is checked. Below these is a 'Use SSL' section with a checkbox labeled 'Use SSL to connect to the remote machine.' (default: true), which is also checked and highlighted with a red box.

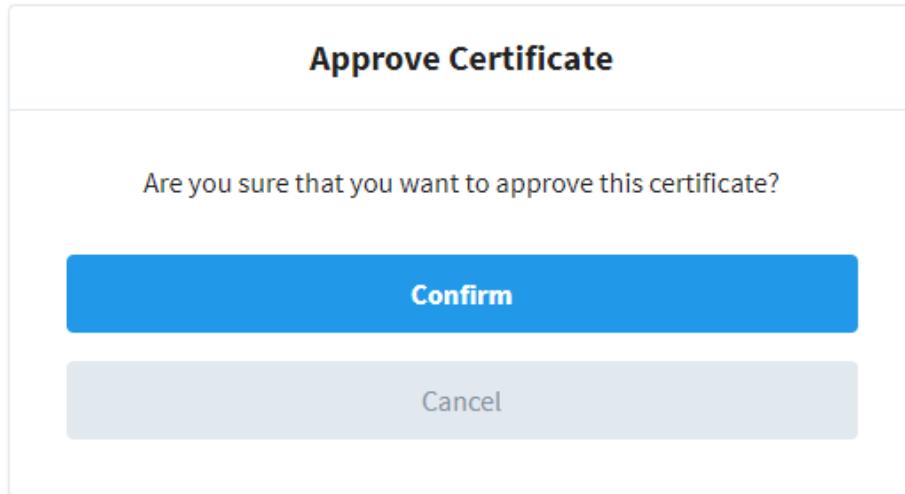
6. Use the default settings in the **Ping** section and **Timeouts** section of the page.
7. Click the **Create New Outgoing Gateway Connection** button at the bottom of the page.
8. You'll see a confirmation message that the connection was created.

The screenshot shows the Ignition configuration interface after creating a new connection. The left sidebar shows 'Gateway Network' selected. The main panel shows the 'Outgoing Connections' tab selected. A green success message box is displayed with the text 'Successfully created new Outgoing Gateway Connection "http://10.10.110.52"' with a checkmark icon. Below this is a table with columns Host, Port, Enabled, Gateway Name, Redundancy Role, and Status. One row is present: Host http://10.10.110.52, Port 8088, Enabled true, Gateway Name Unknown, Redundancy Role Unknown, Status Connecting. At the bottom is a button labeled 'Create new Outgoing Gateway Connection...'.

9. At this point, your Gateway transmitted its certificate to the connected Gateway, but the incoming connection is not yet allowed. The Gateway's connection will not show up under the Incoming Connections tab until after the certificate has been approved.
10. Log into the other Gateway. Navigate to **Config > Networking -> Gateway Network**.
11. Click on the **Incoming Connections** tab. The first Gateway's certificate should be present. The certificate Common Name field holds the network address of the machine that transmitted the certificate. The Serial field holds a numeric string that is automatically generated when the certificate is created, and is unique to every certificate.

| Common Name | Serial              | Issuer | Status       |
|-------------|---------------------|--------|--------------|
| backup:8060 | 8830218834790436753 | Self   | Not Approved |

12. Click the **approve** button to accept the certificate. You'll see a confirmation message. Click the **Confirm** button.



## Deleting Connections

Outgoing and incoming connections can be deleted for cases when the connection no longer exists on the other side.

1. To delete a connection, navigate to **Config -> Networking -> Gateway Network**.
2. Click on either the **Outgoing Connections** tab or the **Incoming Connections** tab.
3. Click **More**, and then select **Delete** next to the connection.

**Note:** For incoming connections, if a remote machine is still connected to the local machine with an outgoing connection, a new incoming connection will be created after deletion. For these cases, you must log into the remote Gateway and delete the outgoing connection. Then you can delete the local incoming connection.

The screenshot shows the Ignition configuration interface. The left sidebar has sections for SYSTEM (Home, Status, Config), NETWORKING (Gateway Network, Email Settings), and SECURITY. The main area shows 'Config > Network > Gateway Network Settings'. The 'Outgoing Connections' tab is selected. A table lists connections with columns: Host, Port, Enabled, Gateway Name, Redundancy Role, and Status. One row is shown: Host 10.10.115.3, Port 8060, Enabled true, Gateway Name Ignition-ignition8-ubuntu-64bit, Redundancy Role Independent, Status Running. Below the table is a link to 'Create new Outgoing Gateway Connection...' and a 'More' dropdown with 'edit' and 'delete' buttons. The 'delete' button is highlighted with a red box.

## Certificates and SSL

When a remote machine establishes an incoming connection, its Gateway server name is transmitted and appears in the Server Name field under **Gateway Network -> Incoming Connections**. However, there is no identity authentication is performed when the connection is created. The local system accepts the remote system id without question. To perform identity authentication on a connection, you must use Secure Socket Layer (SSL) and certificates. By default, SSL is enabled.

**Note:** When using the Gateway Network and Redundancy, SSL Certificates are automatically pushed from the redundant Master to the Backup.

### Requiring a Certificate

1. To require all incoming Gateways to use SSL, navigate to **Config -> Networking -> Gateway Network**.
2. Select the **General Settings** tab, and check the **Require SSL** checkbox.
3. Click the **Save Changes** button.

## Denying a Certificate

You can deny a certificate under the Certificates tab by clicking the deny link to the right of the certificate. The connection that has been using that certificate will no longer be allowed to connect. You can delete certificates that are no longer in use. Keep in mind that if you delete a certificate, and a remote machine is still using that certificate, it will reappear on the Certificates page. In this case, you must navigate to the remote Gateway and delete its outgoing connection. Then you can permanently delete the certificate from the [Certificates page](#).

## Gateway Network Diagnostics

The Diagnostics tab on the Gateway Network Settings page gives you insight to the Gateway and and remote server response times.

1. To test the response time of a remote server, select the server name from the **Server** dropdown list.
2. Click the **Submit** button.

General Settings    Outgoing Connections    Incoming Connections    **Diagnostics**    Queue Management

## Gateway Network Diagnostics

### Gateway Network Port

This server is listening on port **8060** for incoming SSL certificates/connections.

### Test Remote Server Response

| Server                                                                       | Submit        |
|------------------------------------------------------------------------------|---------------|
| <input type="button" value="Choose One"/><br><b>Choose One</b><br>Controller | <b>Submit</b> |
| Ignition-dartmouth-backup                                                    |               |
| Ignition-dartmouth-backup-B                                                  |               |
| Ignition-mrob-lt4                                                            |               |
| ignition8-ubuntu-64bit:8060                                                  | Serial        |
|                                                                              | Issuer        |
| 5585666939040193040                                                          | Self          |

- The results will be displayed indicating if the call to the remote server was successful, what the response time was, and if there were any errors.

General Settings    Outgoing Connections    Incoming Connections    **Diagnostics**    Queue Management

## Gateway Network Diagnostics

### Gateway Network Port

This server is listening on port **8060** for incoming SSL certificates/connections.

### Test Remote Server Response

| Server     | Submit        |
|------------|---------------|
| Controller | <b>Submit</b> |

### Results

|               |                |
|---------------|----------------|
| Call Result   | <b>SUCCESS</b> |
| Response Time | 24 ms          |
| Error         | None           |

### Local Certificate Information

| Common Name                 | Serial              | Issuer |
|-----------------------------|---------------------|--------|
| ignition8-ubuntu-64bit:8060 | 5585666939040193040 | Self   |

## Gateway Network Queue Management

Ignition's Gateway Network system shares information across Gateways using a configurable number of send and receive threads. Ignition's Gateway Network also has a queue associated with each Ignition sub system. These queues enable Ignition to prioritize which subsystem should have access to a send or receive thread at any given time. For example, there are two Gateways, Gateway A and Gateway B, connected via Gateway Network. Gateway A is sending a lot of Tag History queries to Gateway B per the Outgoing Tasks list of Gateway A. If Gateway B takes a long time to return a query result for each query request, Gateway B could potentially starve the send or receive threads for the connection. Starving the send or receive threads for the connection could potentially affect other Ignition sub-systems aside from Tag History. A solution is to limit the Max Active setting on the Call Results Queue configuration in Gateway A to 3. This will make sure that no more than three send or receive threads are used for the Tag History requests coming from Gateway A. Doing this will slow down the Tag History requests and therefore the Tag History queries but it will allow for other Ignition sub systems to gracefully send and receive messages without interruption. The Queue Management tab allows users to manage how a queue should behave for a specific Ignition subsystem. The queue settings for each type of outgoing queue are displayed on this page along with each queue's description.

| Gateway Network Settings |                                                                   |                      |                      |                  |            |                         |
|--------------------------|-------------------------------------------------------------------|----------------------|----------------------|------------------|------------|-------------------------|
| General Settings         | Outgoing Connections                                              | Incoming Connections | Diagnostics          | Queue Management |            |                         |
| Queue Name               | Description                                                       |                      | Synchronous Delivery | Priority         | Max Active | Settings Overridden?    |
| Call Results Queue       | Handles results for remote service calls over the Gateway Network | false                | Highest              | Unlimited        | false      | <button>modify</button> |
| Default Queue            | Generic Gateway Network queue                                     | false                | Normal               | Unlimited        | false      | <button>modify</button> |
| Long Wait Queue          | Handles messages that take up to an hour to deliver               | false                | Low                  | Unlimited        | false      | <button>modify</button> |
| Proxy Queue              | Fowards requests through a proxy Gateway                          | false                | AboveNormal          | Unlimited        | false      | <button>modify</button> |
| Tag Value Publishing     | Handles tag value change events                                   | true                 | Normal               | 1                | false      | <button>modify</button> |

Clicking the Modify button for one of these queues will bring up the Queue Settings page as below:

| Queue Settings                                     |                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Queue Name                                         | Call Results Queue                                                                                                                                                                                                                                                                                                                                              |
| Description                                        | Handles results for remote service calls over the Gateway Network                                                                                                                                                                                                                                                                                               |
| Synchronous Delivery                               | <input type="checkbox"/> This setting is configured by the queue and is unchangeable. If true, the queue will not dispatch another task until the current active task has completed. Note that when a queue uses synchronous delivery, the maximum number of allowed active tasks is fixed at 1 and cannot be changed.<br>(default: false)                      |
| Max Active                                         | <input type="text" value="-1"/><br>The maximum number of active tasks allowed at a time. A task is considered active when it has been dispatched to the Gateway Network connection. You can set a limit to ensure that the Gateway Network connection will not become overloaded. Set this value to -1 to not enforce a limit on active tasks.<br>(default: -1) |
| Priority                                           | <input type="button" value="Highest"/><br>Determines the queue's priority in relation to other queues. A lower priority may result in messages in this queue taking longer to send, but can help prevent a Gateway Network connection from being overloaded.<br>(default: Normal)                                                                               |
| <a href="#">Create New Queue Override Settings</a> |                                                                                                                                                                                                                                                                                                                                                                 |

## Queue Settings

| Settings             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Queue Name           | Name of the queue you are modifying (read only).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Description          | Description for the queue you are modifying (read only).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Synchronous Delivery | This setting is configured by the queue and is unchangeable. If true, the queue will not dispatch another task until the current active task has completed. When a queue uses synchronous delivery, the maximum number of allowed active tasks is fixed at 1 and cannot be changed. Default is false. <p><b>Note:</b> Some queues are hard-coded as "Synchronous Delivery" queues, for example the Tag Value Update queue. For these queues, the Max Active setting is fixed at 1 and cannot be changed by the user. The user can only change the priority of the queue.           </p> |
| Max Active           | The maximum number of active tasks allowed at a time. A task is considered active when it has been dispatched to the Gateway                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

|          |                                                                                                                                                                                                                    |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | Network connection. You can set a limit to ensure that the Gateway Network connection will not become overloaded. Set this value to -1 to not enforce a limit on active tasks. Default is -1.                      |
| Priority | Determines the queue's priority in relation to other queues. A lower priority may result in messages in this queue taking longer to send, but can help prevent a Gateway Network connection from being overloaded. |

# Database Connections

## How Are Databases Used in Ignition?

While connecting to a database is not required for basic status and control functionality, it can dramatically increase the possibilities that the system offers. There are a few places where databases are used in Ignition, such as historical data logging, reporting, storing alarm logs, and as your Tags storage.

### Historical Data Logging

Logging data for historical analysis, either through [Tags Historian](#) or with the [SQL Bridge module](#), require s a database connection. Databases are great at handling historical data, and by using a standard relational database your data is stored in an open format that can be used in many ways.

### Reports, Graphs, and Charts

The Vision module makes it easy to present data stored in databases in a variety of ways. You can quickly create charts that show performance over time, locate anomalies, detect trends, and more. Furthermore, it's important to remember that it is possible to pull data from any database that Ignition is connected to, even if the data wasn't placed there by Ignition. This means you can tie in data from other sources or areas of your company, such as pulling in inventory and staff information, as well.

### Storing Alarm Logs

[Store alarm information historically](#) and examine it later for patterns or trouble spots.

## Getting Started with Databases

The first step in using a database with Ignition is to identify a database server. Many companies already have database servers maintained by their IT departments. If you do not, or wish to set up your own database server for Ignition, the [Supported Databases](#) section below offers some advice on choosing a database vendor.

Once you've identified a server, all you need to do is [create a connection](#) to that server to get up and running.

## On this page ...

- [How Are Databases Used in Ignition?](#)
  - [Historical Data Logging](#)
  - [Reports, Graphs, and Charts](#)
  - [Storing Alarm Logs](#)
- [Getting Started with Databases](#)
  - [Supported Databases in Ignition](#)
  - [Database](#)
  - [Version](#)
  - [Choosing other Databases](#)
  - [Installing and Connecting to a Database](#)
- [Database Drivers and Translators](#)
  - [What Is JDBC?](#)
  - [JDBC in Ignition](#)
- [Monitoring Connection Status](#)

The screenshot shows the Ignition software's configuration interface. The left sidebar is organized into several sections: Home, Status, Config (which is currently selected), System, Networking, Security, and Databases. Under Databases, the 'Connections' tab is active. The main content area displays a list of supported databases, each with a brief description. A green banner at the top indicates 'Trial Mode' with a duration of 0:26:45 and a message about testing the software. A 'Activate Ignition' button is located in the top right corner.

## Supported Databases in Ignition

Ignition has been tested with the following databases, and can connect to them directly after installation. You can connect to other databases by installing additional JDBC drivers (the Java database connection specification), which are often provided by database vendors.

| Database               | Version                                                                                                                                                                                                                                                                                                                 |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Full Support</b>    |                                                                                                                                                                                                                                                                                                                         |
| MySQL                  | 5.0+ for full support. Ignition can connect to 4.x, but many features such as Tags are not tested.                                                                                                                                                                                                                      |
| Microsoft SQL Server   | 2005, 2008, 2012, 2014, 2016, 2017 (full and express editions). Ignition can connect to 2000, but has not been fully tested.                                                                                                                                                                                            |
| Oracle                 | 10g, 11g, 12c (full and express). The letters stand for "grid" and "cloud"                                                                                                                                                                                                                                              |
| PostgreSQL             | 8.0+                                                                                                                                                                                                                                                                                                                    |
| Firebird               | All versions.                                                                                                                                                                                                                                                                                                           |
| IBM DB2                | 9.5+                                                                                                                                                                                                                                                                                                                    |
| SQLite                 | A driver for the popular embedded database system. This can be used to connect to an existing SQLite database, or create a new database: setting the connect URL property to a file that doesn't exist will result in the driver attempting to create the database.                                                     |
| <b>Limited support</b> |                                                                                                                                                                                                                                                                                                                         |
| Other JDBC drivers     | Due to variances in databases, some features may not work fully through other non-tested JDBC drivers. However, it is usually possible to get full functionality through the careful use of the database translator feature.<br><br>For example, the JDBC driver for MariaDB could be downloaded and added to Ignition. |

## Choosing other Databases

If you are new to working with SQL databases and are trying to choose a vendor, you need to consider the following three factors:

## **1- Existing company usage**

Many companies already use SQL databases for other purposes, and thus most IT departments already have a defined standard. Going along with your company's existing standard is usually recommended, as there will already be staff available who are knowledgeable about the system. Furthermore, you may be able to tie into your company's existing database system instead of maintaining your own.

## **2 - Price and Features**

The fully supported databases shown above vary dramatically in price. Some systems can cost thousands of dollars, but may have a free "express" edition that will work perfectly well for your requirements. Others offer advanced features such as redundancy, which are either not offered or difficult to configure in the other systems. It is therefore important to clearly define the features and capabilities that you need.

## **3 - Most common among Inductive Automation users**

Choosing a database that is commonly used by Inductive Automation users means that you are more likely to find examples and help in the [Forum](#), among other benefits. The supported database list above is sorted according to our current user install base.

### **Installing and Connecting to a Database**

Once you've identified a server, all you need to do is create a connection to that server to get up and running. See the [Installing Databases](#) and [Connecting to Databases](#) sections for details about how to install and connect to different databases through Ignition.

If we don't already have a connector for your database type, you can [simply add it in](#) yourself.

### **Database Drivers and Translators**

#### **What Is JDBC?**

JDBC stands for the Java DataBase Connectivity API. It is a standardized way for Java-based applications to interact with a wide range of databases and data sources. A JDBC Driver enables Ignition to connect to, and use data from, a particular database system.

#### **JDBC in Ignition**

Ignition, being a Java-based application, leverages JDBC in order to connect to a variety of data sources. This enables Ignition to offer a standardized set of functionality on a wide range of different systems and databases. This includes not only commonly-used databases such as MySQL, Microsoft SQL Server, and Oracle, but additionally other lesser-known systems as well, provided the manufacturer offers a JDBC driver for the system.

The screenshot shows the Ignition configuration interface. The left sidebar has sections for Home, Status, and Config. Under Config, there are tabs for Overview, Backup/Restore, Ignition Exchange, Licensing, Modules, Projects, Redundancy, and Gateway Settings. Below these are sections for Networking (Web Server, Gateway Network, Email Settings), Security (Auditing, Users, Roles, Service Security, Identity Providers, Security Levels, Security Zones), and Databases (Connections, Drivers). The 'Drivers' tab is highlighted with a red box. The main content area shows a table of JDBC drivers:

| Name                | Driver Type          | Default Translator | Status                                                              | Actions                                     |
|---------------------|----------------------|--------------------|---------------------------------------------------------------------|---------------------------------------------|
| MariaDB             | MySQL                | MYSQL              | Installed                                                           | <a href="#">delete</a> <a href="#">edit</a> |
| Microsoft SQLServer | Microsoft SQL Server | MSSQL              | Installed                                                           | <a href="#">delete</a> <a href="#">edit</a> |
| MySQL               | MySQL                | MYSQL              | Installed                                                           | <a href="#">delete</a> <a href="#">edit</a> |
| Oracle Database     | Oracle               | ORACLE             | Error - either required files are missing or classname is incorrect | <a href="#">delete</a> <a href="#">edit</a> |
| PostgreSQL          | PostgreSQL           | POSTGRES           | Installed                                                           | <a href="#">delete</a> <a href="#">edit</a> |

Below the table is a link to 'Create new JDBC Driver...' and a note: 'Note: Please see [this help page](#) for information about installing driver files that are not able to be bundled with Ignition.'

## Monitoring Connection Status

The state or status of a database can be monitored from the **Status** section of the Gateway Webpage, under **Connections > Databases**. The status panels show the current state and a fault message, if applicable, or throughput statistics if the connection is active.

When a connection is not available, it is re-tested every 10 seconds, and the status is updated.

The screenshot shows the Ignition configuration interface. The left sidebar has sections for Home, Status, and Config. Under Config, there are tabs for Overview, Backup/Restore, Ignition Exchange, Licensing, Modules, Projects, Redundancy, and Gateway Settings. Below these are sections for Networking (Web Server, Gateway Network, Email Settings), Security (Auditing, Users, Roles, Service Security, Identity Providers, Security Levels, Security Zones), and Databases (Connections, Drivers). The 'Connections' tab is highlighted with a red box. The main content area shows a table of database connections:

| Name      | Description | JDBC Driver         | Translator | Status       | Actions                                     |
|-----------|-------------|---------------------|------------|--------------|---------------------------------------------|
| DB        |             | MariaDB             | MYSQL      | Faulted      | <a href="#">delete</a> <a href="#">edit</a> |
| MSSQL     |             | MySQL               | MYSQL      | Valid        | <a href="#">delete</a> <a href="#">edit</a> |
| SQLServer |             | Microsoft SQLServer | MSSQL      | Reconnecting | <a href="#">delete</a> <a href="#">edit</a> |

Below the table is a link to 'Create new Database Connection...' and a note: 'Note: For details about a connection's status, see the [Database Connection Status](#) page.'

[Related Topics ...](#)

- [SQL in Ignition](#)
- [JDBC Drivers and Translators](#)

[In This Section ...](#)

# Installing Databases

## Why Install a Database?

A lot of additional functionality becomes simple or is only accessible when Ignition is connected to a database. Storing Historical data, storing notes or files, and creating dynamic lists to name a few. It is important to note that Ignition does not install any databases for you. There are many types that you can connect to, but you need to choose the database that is best for you. Installing your own database means you have complete control over it, anything Ignition adds to it can be accessed by another program easily.

You can install as many database systems as you like, and each of them allow you to create as many schemas (or groups of data) as you want. You get to decide where your database is installed, or where you want to install all of them.

## On this page ...

- [Why Install a Database?](#)
- [Which Database Should You Use?](#)
- [Where to Install a Database](#)

## Which Database Should You Use?

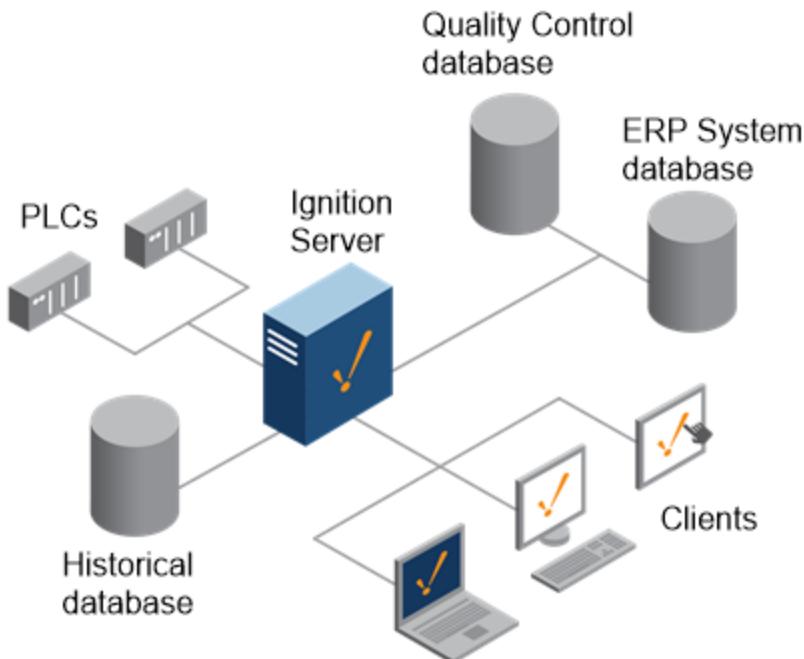
There is a lot of debate on this subject but the short answer to this question is 'whichever database your IT department already uses.' Modern relational database all have the same basic functionality, but slightly different ways of doing things. If your IT department already supports Microsoft SQL Server (MSSQL), then they already have the tools and knowledge to manage those databases. Because they are so similar (and Ignition takes care of so much for you), it is almost always easier to learn to use an existing database than to add IT support for a second type. Not to mention that adding a second type might mean hiring new personnel in the IT department.

If your company does not already have a database preference, then it's up to you to decide which is best based on your needs. They all have a free version, but different limitations. For example: MSSQL has a cap on how much data can be stored in their free version. MySQL does not have a cap like this, but also does not allow phone support for their free version.

## Where to Install a Database

You can install your database anywhere that Ignition has access to through the network. There are two main options for installing your database: one is on the computer that Ignition is installed on, and the other is installed on a different server in your network. Technically, there is a third option to connect Ignition to a database that is in a remote location using a VPN or some other way to access it. This third option will work, but because of latency and the data being physically very far away, it is not recommended for storing data that will be accessed often like Tag History.

For production systems, we recommend that your database is on its own server, not installed on the computer with Ignition. This is helpful for many reasons, but mostly because databases can potentially take up a lot of resources on a computer. If the database is on its own computer, you don't have to worry about other programs starving for memory or CPU. If you do this and install your database on another computer, just make sure to adjust your firewalls and pay attention to the database connection security. Most databases don't allow the default username to connect remotely.



[In This Section ...](#)

# Installing MySQL

## Install MySQL Server and MySQL Workbench

The goal of this page is to demonstrate how to install MySQL Server, and a helpful tool called MySQL workbench. This guide is not an exhaustive listing of all of the various installation steps or scenarios for MySQL. For more information, take a look at MySQL's documentation: [MySQL Documentation](#).

1. Go to the MySQL website at <https://dev.mysql.com/downloads/mysql/>
2. Scroll-down to **Windows (x86, 32-bit), MSI Installer**. You will notice multiple download options. Both allow you to install MySQL

**Note:** MySQL Installer is 32-bit, but will allow you to install the 64-bit version of MySQL.

The screenshot shows the MySQL Community Downloads page. Under the "MySQL Installer 8.0.20" section, there are two download options: "Windows (x86, 32-bit), MSI Installer" and "Windows (x86, 32-bit), MSI Installer". The first option is highlighted with a red box. Both options show a file size of 8.0.20, 24.4M, and a "Download" button. Below the download buttons, there is a note: "We suggest that you use the MD5 checksums and GnuPG signatures to verify the integrity of the packages you download."

## On this page ...

- [Install MySQL Server and MySQL Workbench](#)
- [Running the Installer](#)

The screenshot shows the Inductive University logo (IU) and two sections: "Installing MySQL" and "Watch the Video".

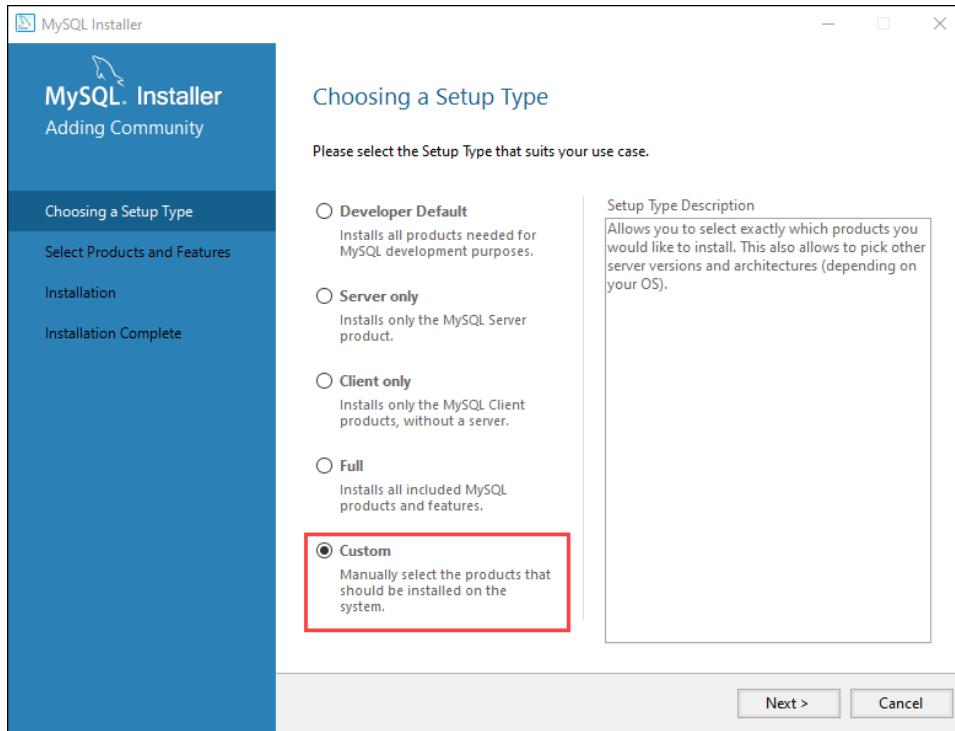
3. Click on the **Download** button.
4. On the next page, you can login or create an account if you'd like. Otherwise click **No thanks, just start my download**.

The screenshot shows the MySQL Community Downloads page for a specific file. It includes a "Login Now or Sign Up for a free account" section, a list of advantages for Oracle Web Account users, and two prominent buttons: "Login »" and "Sign Up »". Below these buttons, it says: "MySQL.com is using Oracle SSO for authentication. If you already have an Oracle Web account, click the Login link. Otherwise, you can signup for a free account by clicking the Sign Up link and following the instructions." At the bottom of the page, there is a red box around the text "No thanks, just start my download."

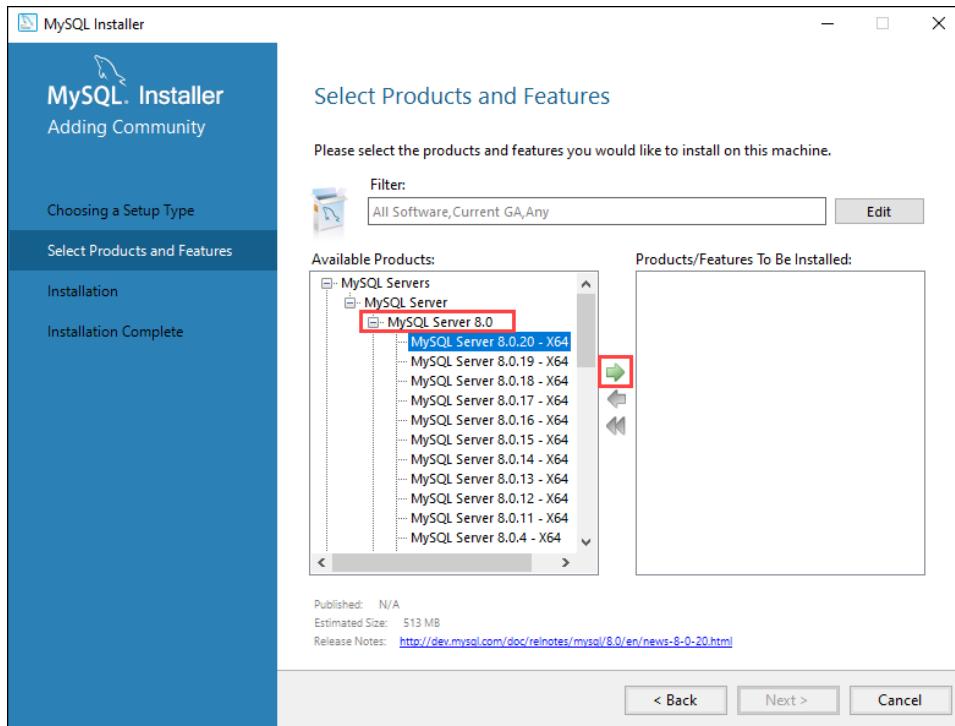
## Running the Installer

1. Once the **.msi** file is downloaded, run the file to begin the installation process.
2. The **Welcome** window is displayed. Select the **Install MySQL Products** action.
3. On the Choosing a Setup Type page, select **Custom** and click **Next**. While you can select one of the other options, at minimum you'll want to install both the server (the actual database) and MySQL Workbench (an application that allows you to quickly and easily interact with the database, without using a command-line client). Any other items beyond these two are generally unnecessary in most environments.

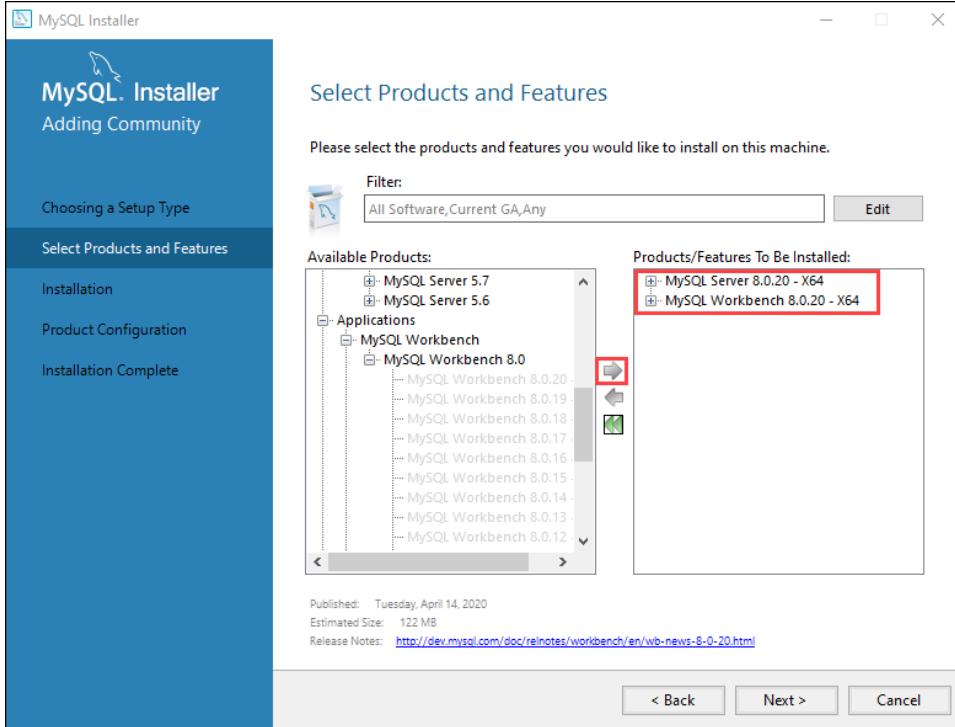
If you want to learn more, MySQL does have some additional information on their documentation if you're curious about the other options: [MySQL Docs](#). This example will continue with a Custom installation.



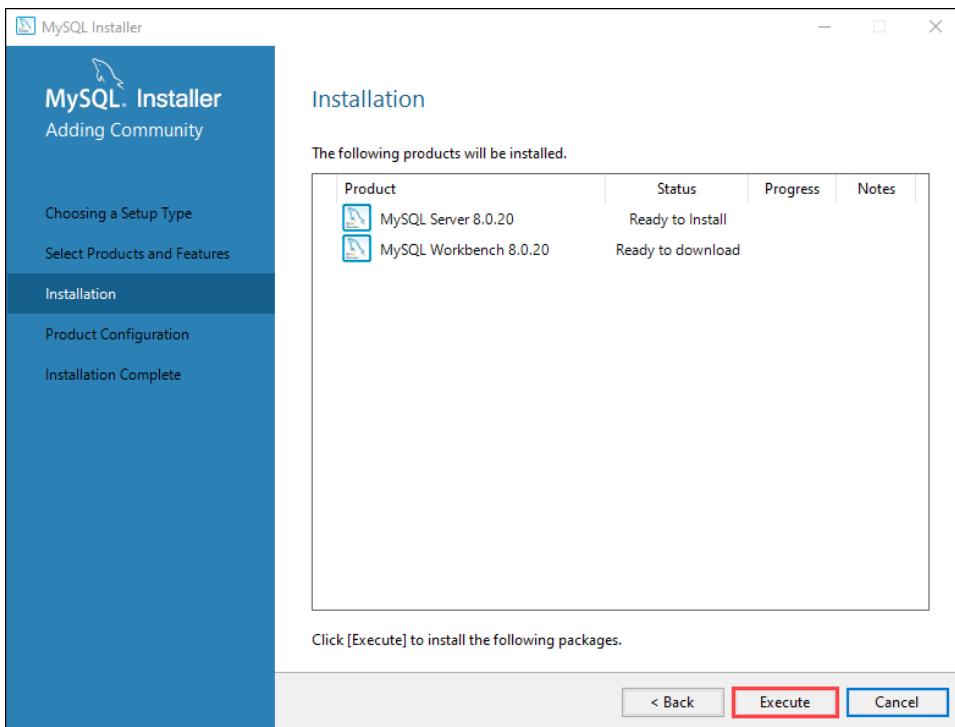
4. On the Select Products and Features page, scroll down to choose **MySQL Server 8.0**. Click the right arrow to move it to the "Products /Features To Be Installed" column.



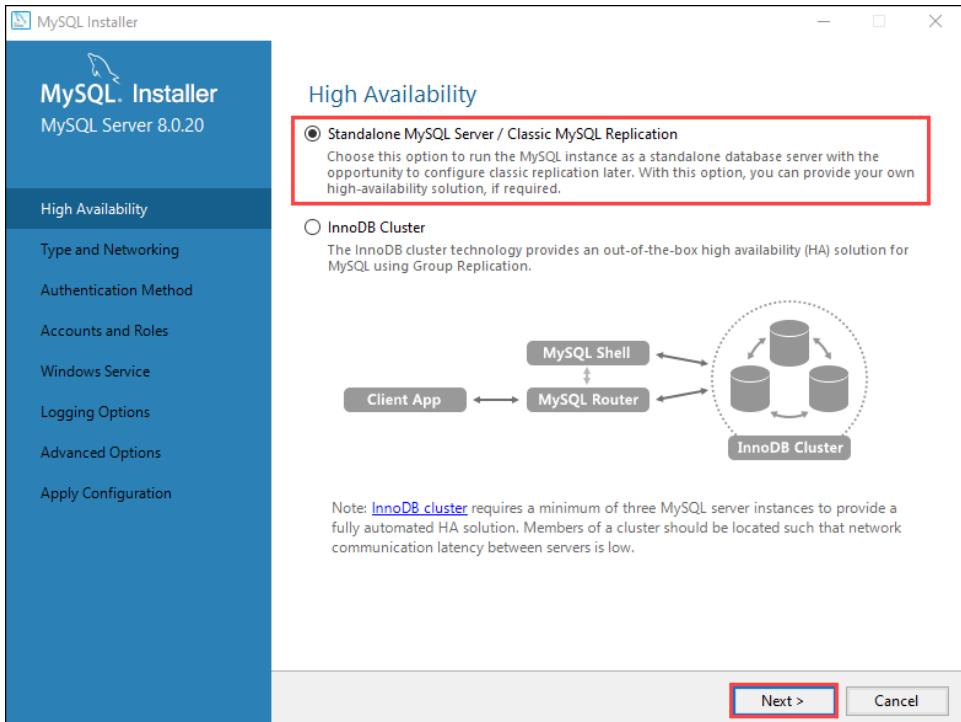
5. Scroll down to MySQL Workbench, select a version, and click the right arrow to move it to the "Products/Features To Be Installed" column.
6. Click **Next**.



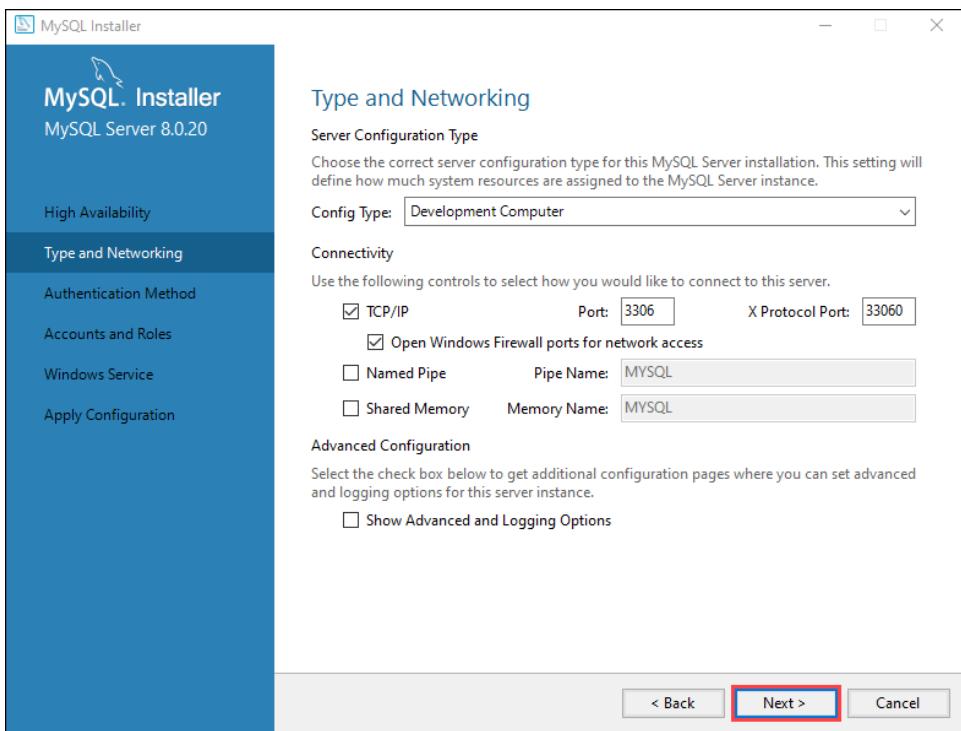
7. On the Installation screen, click **Execute**.



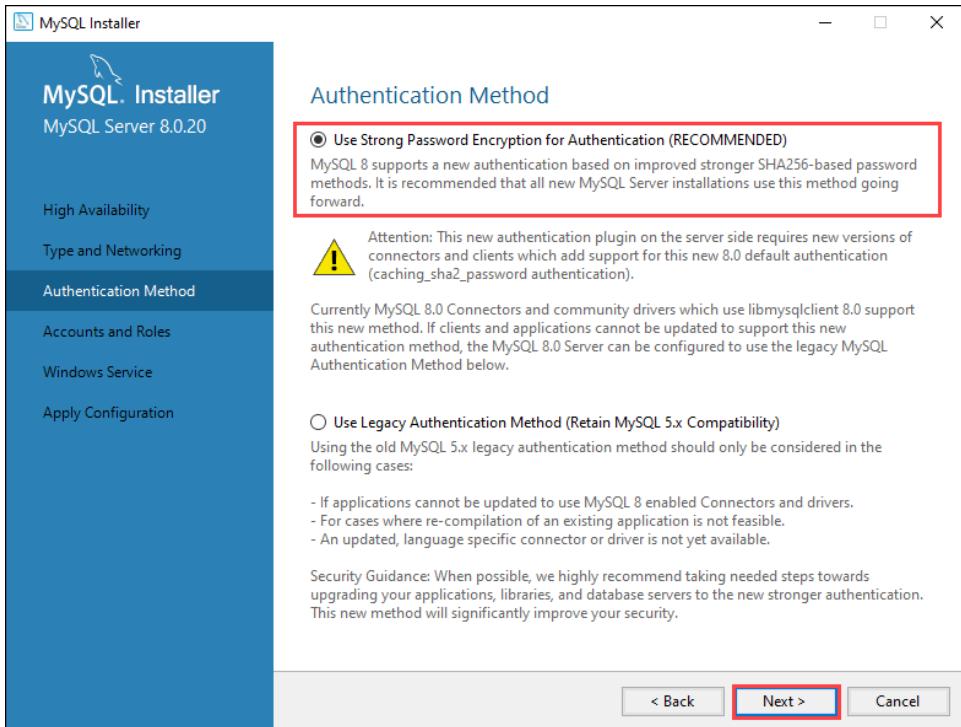
8. After these are downloaded and installed, you see the Product Configuration page. Click **Next**.
9. In this guide, we're going to use a standalone server. On the High Availability page, select **Standalone MySQL Server / Classic MySQL Replication**, and click **Next**.



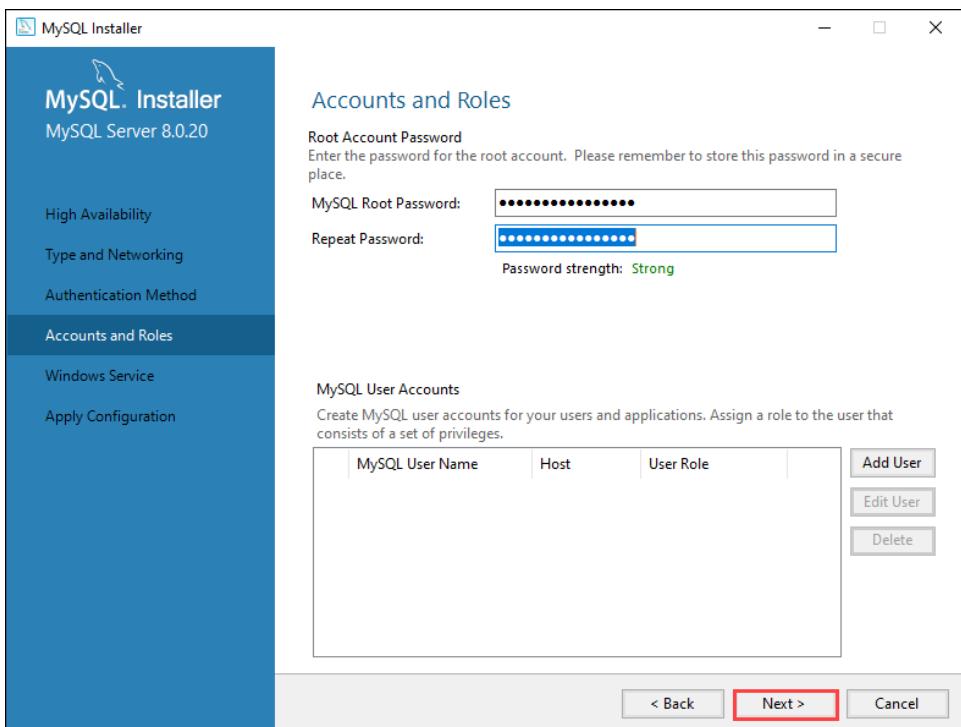
10. Leave the default settings on the Type and Networking page. Click **Next**.



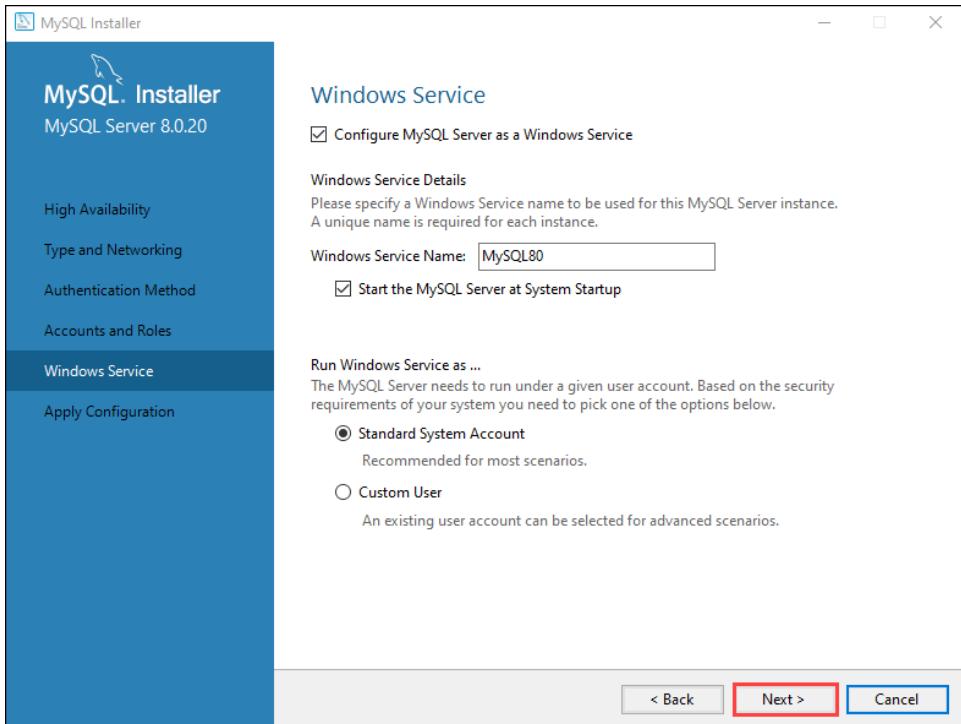
11. On the Authentication Method page, choose **Use Strong Password Encryption for Authentication**. Click **Next**.



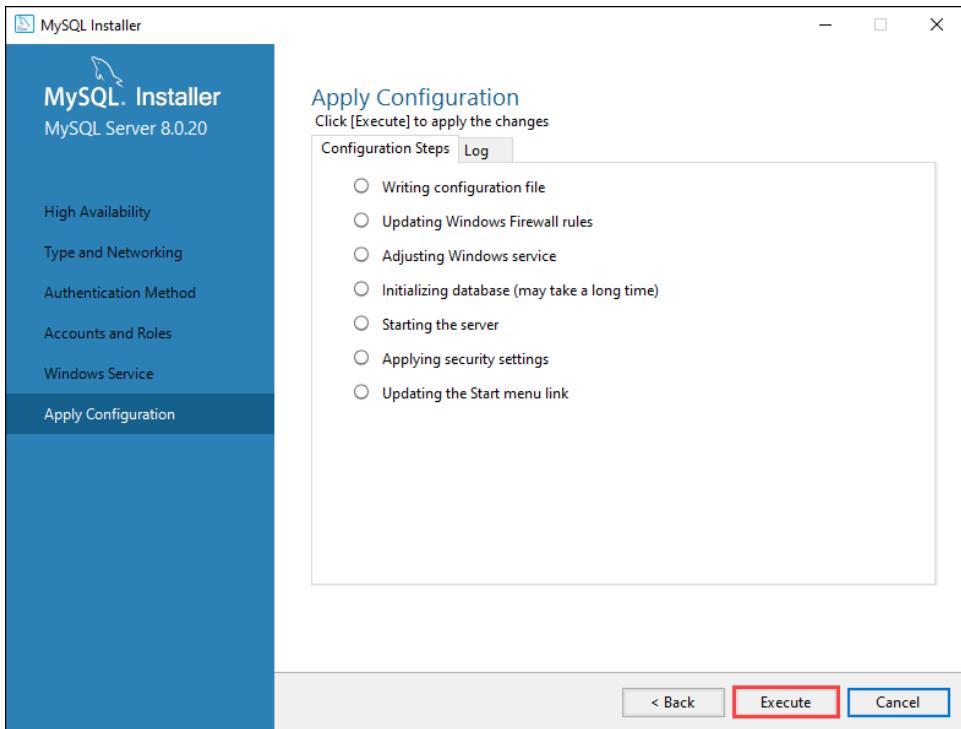
12. Create a strong password and click **Next**.



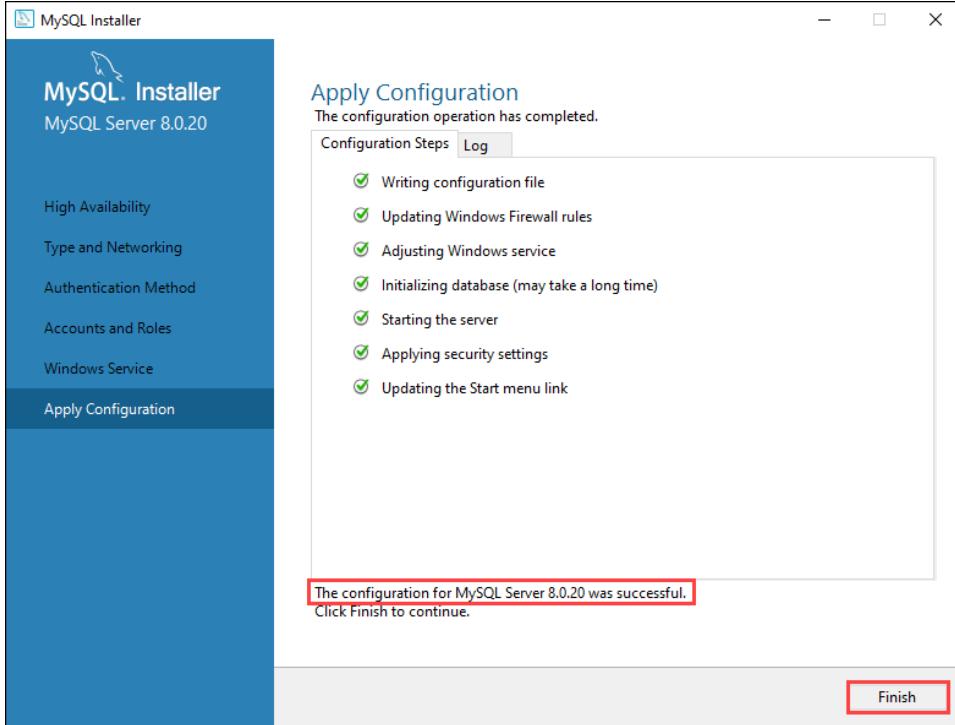
13. On the Windows Service page, leave the default settings and click **Next**.



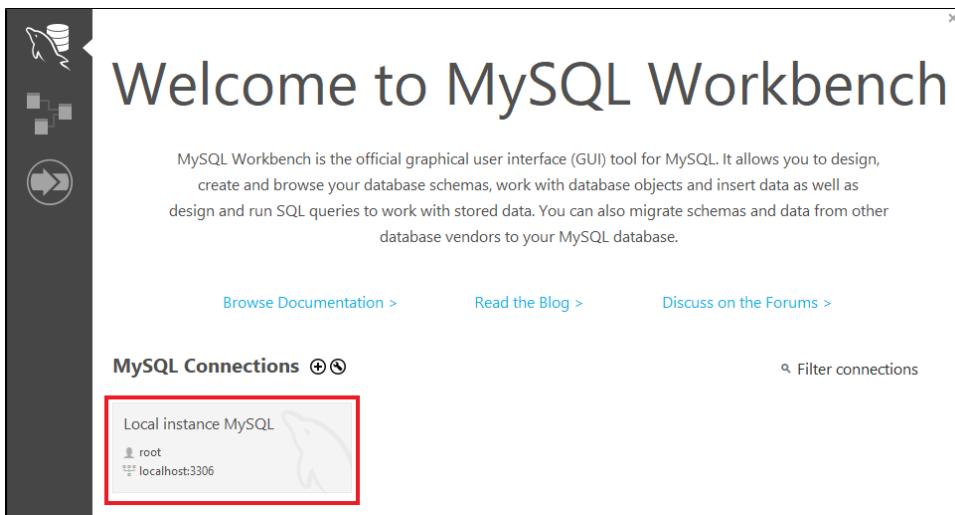
14. On the Apply Configuration page, click Execute.



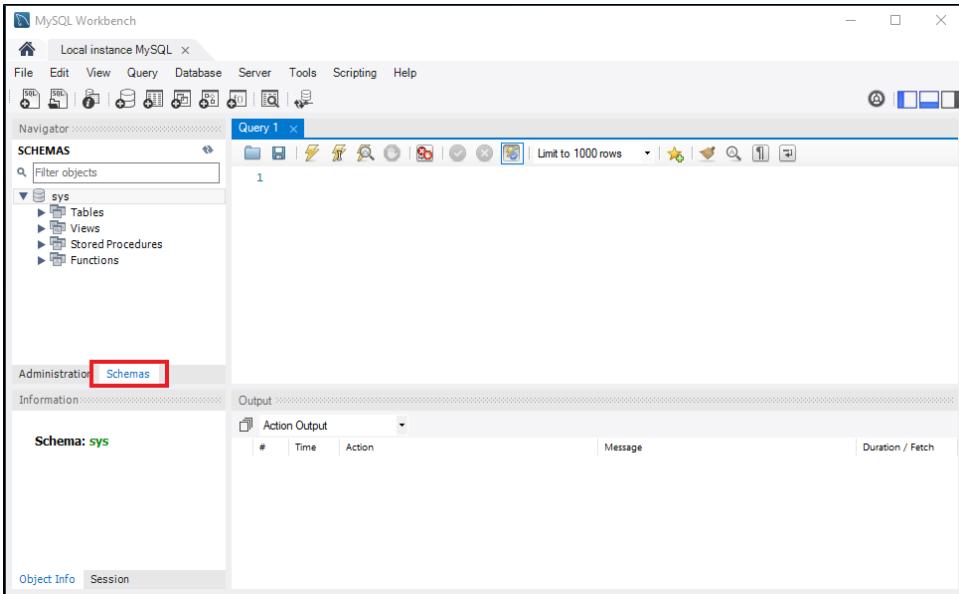
15. Once the configuration is applied and the database is initialized, you'll see a confirmation message. Click **Finish** to complete the install process.



16. The **MySQL Workbench** window is displayed. MySQL Workbench lets you to administrate the MySQL server.
17. Click on **Local instance MySQL** to connect to the newly installed MySQL server.

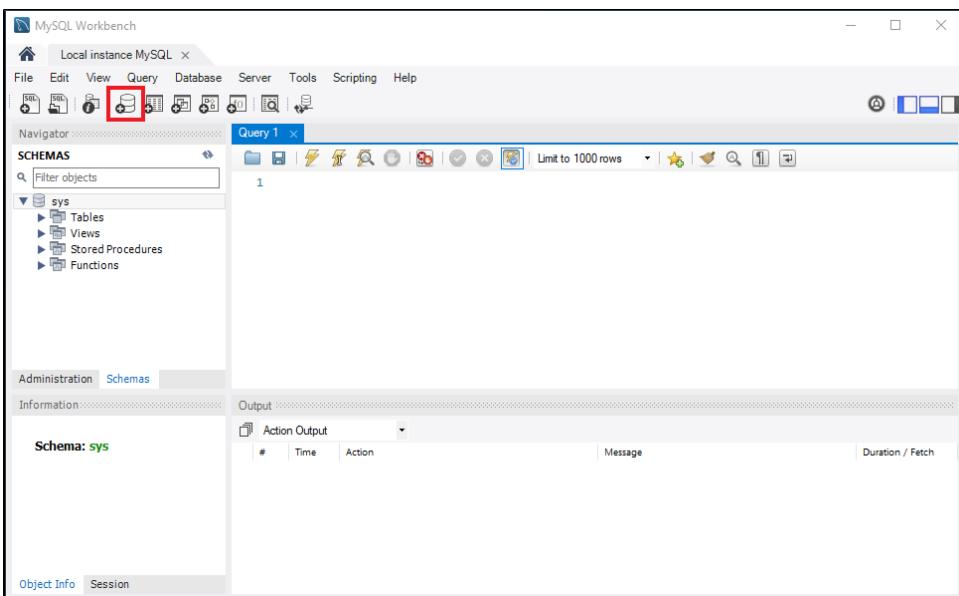


18. Enter the root **password** you earlier entered into the installer and click **OK**.
19. You are now connected and can see, in the Navigator, the default **sys** schema. Click on the **Schemas** tab to see a listing of schemas

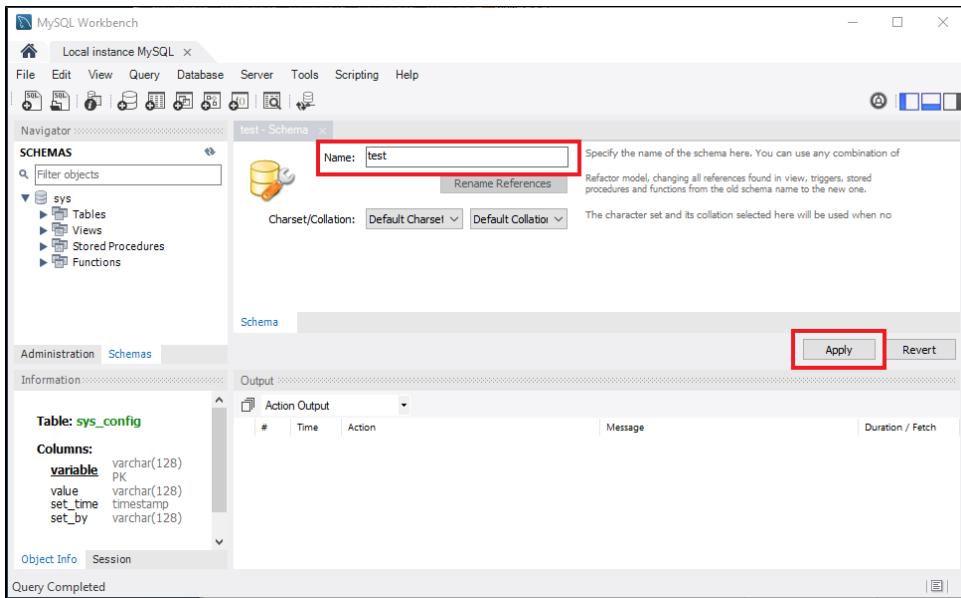


20. A "schema" is a collection of tables and other database objects. Ignition needs a schema to connect to. Instead of using the **sys** schema, we can create a schema dedicated to Ignition.

To create the schema, click the **Create New Schema** icon.

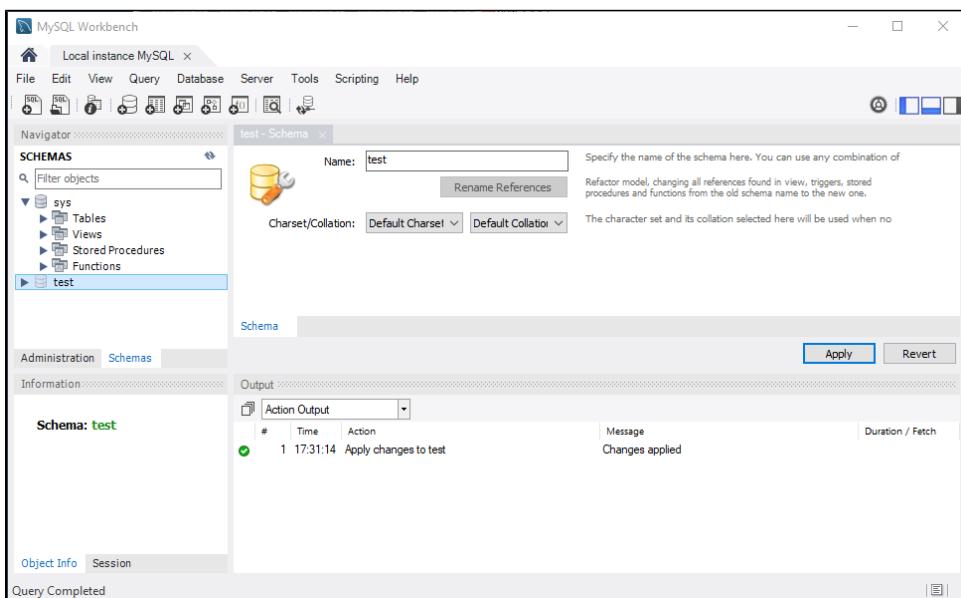


21. You'll see the Schema creation tab. This allows you to make a new **Schema**. Type in **test** as the name, and click **Apply**. Technically you can call the schema anything the database allows, but the default MySQL connection in Ignition assumes a schema named "test". If you name the schema something else here, you'll need to remember the name when creating the database connection in Ignition later.



22. You'll see the **Apply SQL Script to Database** window. Click **Apply**.

23. If there was an issue, the following window will state the issue. Go back and address the issue. Otherwise, click the **Finish** button. You should now see the **test** schema in the Navigator.



Now that the database is installed, you can connect Ignition to it. Learn more here: [Connecting to MySQL](#).

# Installing Microsoft SQL Server Express

You need to download and install both the **SQL Server Express** and the **SQL Management Studio** before you connect to the database.

## To Download SQL Server Express

This section walks through the process of installing a new instance of SQL Server Express.

1. Go to <https://www.microsoft.com/en-us/sql-server/sql-server-downloads>
2. Look for the link/button to download the **Express Edition**.
3. Run the installer
4. When given a choice between installation type, select **Custom**.
5. Select an installation directory. If you don't have a preference, simply use the default.
6. The installer will unpack and download required files.
7. Once the installer is ready, the **SQL Server Installation Center** window will appear. Select the **I nstallation** heading on the side bar, and click on the **New SQL Server stand-alone installation or add features to an existing installation** link.
8. On the **License Terms** window, choose **I accept the license terms** and click **Next**.
9. On the **Product Updates** window, click **Next** to start installing the SQL Server.
10. On the **Feature Selection** window, stay with the default selections and click **Next**. Technically you can uncheck many of the options, like the optional R and Python installations. The Server and SQL Server Management Studio are the main tools you'll need when interacting with an Ignition installation. You can always remove additional components from the SQL Server installer later if you choose so.
11. The **Instance Configuration** window shows **Named instance: SQL Express**, you can keep it or change it if you like. Click **Next**.
12. When asked about a JRE to use, you can use the provided JRE. Click **Next**.
13. On the **Server Configuration** window, choose **Automatic** from the dropdown under **Startup Type** for the **SQL Server Browser** service, and click **Next**.
14. On the **Database Engine Configuration** window, for **Authentication Mode** choose **Mixed Mode**, enter a **password** for the SA account. Note that you can use a Windows Authentication Mode with Ignition, but it does require some [additional configuration](#) when connecting later on. In either case, click **Next**.
15. On the next few windows, continue clicking **Next** until it shows installation is **Complete**. **SQL Server Express** is now installed.

## To Download SQL Management Studio

1. Go to <http://www.microsoft.com/en-us/download/details.aspx?id=8961>
2. Click on the **Download** button.
3. Click on the **SQLManagementStudio\_x64\_ENU.exe** file to run the executable.
4. On the **SQL Server Installation Center** window, click on the **New SQL Server stand-alone installation or add features to an existing installation** link.
5. On the **Installation Type**, keep the defaults and click **Next**.
6. On the **License Terms** window, choose **I accept the license terms** and click **Next**.
7. On the **Product Updates** window, click **Next** to start installing the SQL Server.
8. On the **Feature Selection** window, stay with the default selection of **Management Tools** and click **Next**.

## On this page ...

- [To Download SQL Server Express](#)
- [To Download SQL Management Studio](#)



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## Installing Microsoft SQL Server Express

[Watch the Video](#)

9. On the **Database Engine Configuration** window, for **Authentication Mode** choose **Mixed Mode**, enter a **password**, and click **Next**.
10. On the next few windows, continue clicking **Next** until it shows installation is **Complete**.  
The **Management Tools** is now installed.
11. To run the program, go to **Start > Programs > Microsoft SQL Server > SQL Server Management Studio**.
12. Click on **Connect** to connect to the Microsoft SQL Server.
13. In **Object Explorer**, you can now see some databases under **Databases > System Databases**.
14. Right-click on **Databases** and select **New Databases....**  
The **New Databases** window is displayed.
15. In **Database name**, enter **test**, click **Add**, and then **OK**.  
Now you can see the **test** database in the **Databases** folder and can connect Ignition to it, see [C onnecting to Microsoft SQL Server Express](#).

# Installing PostgreSQL

## To Install the PostgreSQL Database

1. Go to the **PostgreSQL** website at <http://www.postgresql.org>
2. Click on **Downloads**, look for and click on the **Windows** link.
3. On the **Windows installers** page, find the **Download** link and click on it, and on the next page select the installer you are interested in.  
For example, you can select the **Wins x86-32**.
4. From your Download folder on your computer, click on the Postgre .exe file to install the database.
5. Go through all the windows of the **Install Wizard** until installation is complete.
6. From the Windows **Start** menu, open the **PostgreSQL pgAdmin** database.
7. In the **Object browser** of the **pgAdmin** window, right-click on **PostgreSQL**, select **Connect**, enter your **password** to connect to the Server, and click **OK**.  
You will now see the **Databases** folder in the Object browser.

## On this page ...

- [To Install the PostgreSQL Database](#)



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## Installing PostgreSQL

[Watch the Video](#)

# Connecting to Databases

## Connect Once

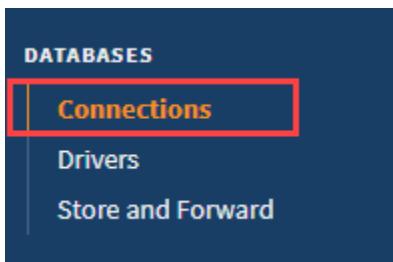
Many of the advanced features of Ignition, such as the Transaction Groups and Tags Historian require a connection to an external database and most databases require special permissions for each computer that wants to connect. Fortunately, Ignition takes care of all of this for us. You can create a connection to your database once and every system in Ignition will use that central connection. There's no need to worry about updating your database settings to add another client.

This central database connection also makes it easy to swap between databases or schemas. You can tell every query to use the default connection, then just change the default to update everything. Alternatively, you can force specific queries or systems to use a particular connection. Create as many database connections as you want and start designing using all of them.

## Add a Database Connection

Now that we've installed your database, let's connect to it. You can find detailed descriptions for many database connections in this User Manual, however, they all include the same steps:

1. On the Gateway Webpage, go to the Gateway **Config** tab. Scroll down to the **Databases > Connections** section.



2. On at the Database Connections page, click on the **Create new Database Connection...** link at the bottom of the table.

A screenshot of the Ignition Gateway Webpage under the 'Config' tab. The left sidebar shows 'SYSTEM' with 'Overview', 'Backup/Restore', 'Ignition Exchange', 'Licensing', 'Modules', 'Projects', 'Redundancy', and 'Gateway Settings'. Under 'NETWORKING', it shows 'Web Server', 'Gateway Network', and 'Email Settings'. Under 'SECURITY', it shows 'Auditing'. The main content area shows a table titled 'Database Connections'. It lists three existing connections: 'DB' (MariaDB, MySQL, Faulted), 'MSSQL' (MySQL, MySQL, Valid), and 'SQLServer' (Microsoft SQLServer, MSSQL, Faulted). At the bottom of the table, there is a red box around the link 'Create new Database Connection...'. A note below the table says 'Note: For details about a connection's status, see the Database Connection Status page.' The top right of the page has a green banner 'Trial Mode 1:24:26 We're glad you're test driving our software. Have fun.' and a 'Activate Ignition' button.

3. The next step is to choose a JDBC Driver.

Ignition connects to databases using JDBC drivers that are unique to each database. Drivers for the most popular databases are included so there is usually no need to install the JDBC driver manually.

Ignition ships with drivers for Microsoft SQL Server, MySQL, Oracle, and PostgreSQL. Pick the JDBC driver for your database, and click on the **Next** button.

If a suitable driver is not available in the list, you need to add a new JDBC driver for other databases, like IBM DB2, which is not very difficult to do, see [Adding a JDBC Driver](#).

4. **Configure the Connection**

After selecting the driver, you'll configure the settings for the connection. Some settings, such as the Connect URL are specific to the driver that you're using.

## On this page ...

- [Connect Once](#)
- [Add a Database Connection](#)

## Main Database Connection Properties

|                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name                                                                                                                                                   | Each database connection needs a unique name, which consists of letters, numbers and underscores.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Description                                                                                                                                            | A brief description of the database.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| JDBC Driver                                                                                                                                            | The JDBC driver dictates the type of database that this connection can connect to. It cannot be changed once created.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Connect URL                                                                                                                                            | A string that instructs the driver how to connect to the database. This string is the server address, and may include the port, instance name, database name, and so on. The format and parameters depend on the driver being used.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Username                                                                                                                                               | The username to use when connecting. Some databases support other authentication methods, such as Windows authentication, in which case this field is not used.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Change Password?                                                                                                                                       | Check the box to change the existing password.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Password                                                                                                                                               | Enter password.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Password                                                                                                                                               | Re-type password for verification.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Extra Connection Properties                                                                                                                            | Depending on which database you are connecting to, there will be different default values placed in this box. MS SQL Server requires you to place your database name here, but for other databases you can usually leave this at its default values.<br>Each database has its own set of available extra connection properties so you must refer to your Database documentation to determine what is valid here.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Enabled                                                                                                                                                | Lets you to enable or disable a database connection.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Failover Datasource                                                                                                                                    | The connection that is automatically used when this connection is not available.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Failover Mode                                                                                                                                          | Lets you select how to handle the database connection failing and recovering.<br>Database connections support <i>failover</i> . This means that the objects which use a database connection will use a different connection if the one they are using becomes unavailable. The <b>Failover Datasource</b> property determines which connection is used, and the <b>Failover Mode</b> determines when, if ever, the connection is switch back to the primary connection.<br>There are two failover modes: <ul style="list-style-type: none"><li>• <b>STANDARD</b> mode means that this datasource will fail over when a connection cannot be retrieved, but when connectivity is restored, connections will again come from this datasource.</li><li>• <b>STICKY</b> mode means that once this datasource fails over, connections will continue coming from the failover datasource until the failover datasource itself fails or the Gateway is restarted.</li></ul> |
| Slow Query Log Threshold                                                                                                                               | Queries that take longer than this amount of time, in milliseconds, will be logged. This helps to find queries that are not performing well. (default: 60,000)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Validation Timeout                                                                                                                                     | The time in milliseconds between database validation checks. (default: 10,000)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Advanced Settings</b>                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| There are many advanced settings that you don't need to change under normal circumstances. See the description for each property on the settings page. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

In This Section ...

# Connecting to MySQL

In order to get connected to MySQL, your Ignition Gateway must have a Translator, a Driver, and a Connection. New Ignition installations do not have the driver (a JAR file), so you will have to acquire the file yourself. See the [JDBC Drivers and Translators](#) page for more details on obtaining the required file.

Once acquired, you can follow the steps for [Upgrading a JDBC Driver](#). Once the JAR file has been provided, you can follow the steps listed on this page to configure a connection between Ignition and MySQL.

## MariaDB Connections to MySQL Databases

Alternatively, Ignition can use the built-in MariaDB driver to connect to MySQL 5.7 and prior databases. This circumvents the need to manually provide a JAR file to the MySQL JDBC Driver configuration on the Gateway.

This feature is new in Ignition version **8.1.2**  
[Click here](#) to check out the other new features

Ignition version 8.1.2 includes a Maria DB driver that can connect to MySQL 8 databases. Note that upgrading Ignition does not replace existing JDBC drivers. See the [JDBC Drivers and Translators](#) page for more information.

## On this page ...

- [MariaDB Connections to MySQL Databases](#)
- [Connect Ignition to MySQL Database](#)

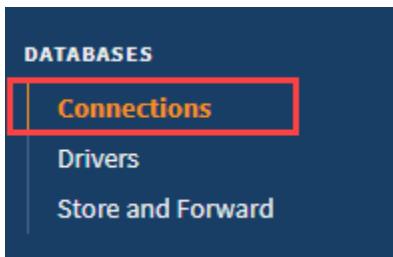


## Connecting to MySQL

[Watch the Video](#)

## Connect Ignition to MySQL Database

1. On the Gateway Webpage, go to the **Config** section.
2. Scroll down to **Databases > Connections**.



3. The Database Connections page is displayed. Click on **Create new Database Connection...**

A screenshot of the Ignition Gateway "Database Connections" page. The left sidebar shows the "Config" section selected. The main area displays a table of connections with two entries: "DB" (MariaDB, MySQL, Faulted) and "MSSQL" (MySQL, MySQL, Valid). A red box highlights the "Create new Database Connection..." button at the bottom left. A note at the bottom right says: "Note: For details about a connection's status, see the [Database Connection Status](#) page." The top right corner shows a "Trial Mode" message and an "Activate Ignition" button.

4. Select the **MySQL ConnectorJ** driver and click **Next**.

The screenshot shows the 'Database Connections' configuration page in Ignition. At the top, there's a green banner with the text 'Trial Mode 1:58:53 We're glad you're test driving our software. Have fun.' and a 'Activate Ignition' button. Below the banner, a message box says: 'Select the correct JDBC Driver for the type of database you wish to connect to. If no driver corresponds to your database, go to the Driver Configuration page to add a new driver.' A red box highlights the 'MySQL' option, which is described as 'The official MySQL JDBC Driver, Connector/J.' Other options shown include MariaDB, Microsoft SQL Server, Oracle Database, Oracle JDBC, PostgreSQL, and SQLite.

Database connections in Ignition are powered by JDBC drivers. Ignition ships with drivers for Microsoft SQL Server, MySQL, Oracle, and a few others.

5. On the New Database Connection page, enter the following information:

Name: **MySQL** (use a meaningful name such as **MySQL**)

Connect URL: **jdbc:mysql://localhost:3306/test** (By default, MySQL creates an empty database called test)

The screenshot shows the 'Main Properties' tab of the 'New Database Connection' dialog in Ignition. The 'Name' field is filled with 'MySQL'. The 'Description' field is empty. The 'JDBC Driver' dropdown is set to 'MySQL'. The 'Connect URL' field contains 'jdbc:mysql://localhost:3306/test'. Below the URL, explanatory text describes the format: 'The Connect URL is JDBC-driver specific. It usually contains the address of the machine that the database is running on. The format of the MySQL connect URL is: jdbc:mysql://host:port/database'. It also specifies the three parameters: host, port, and database.

As you see in the example above, MySQL uses the following **Connect URL** format:  
**jdbc:mysql://hostaddress:3306/database**

Where **hostaddress** is the address of the machine with MySQL installed, for example: localhost, 192.168.1.1, db-server, etc., and **database** specifies the database schema the connection will target. It's important to understand that a MySQL server can host many database files. The connection will target one schema (a collection of tables and other objects) in the database.

6. To configure the connection, enter the following information:

Username: **root**

Password: **mysql** (password is what you entered during MySQL server installation, **mysql** is the password for this example)

Extra Connection Properties: Leave at the default value. By default, the **zeroDateTimeBehavior** parameter is defined and it is usually not necessary to add more parameters unless you are planning to store text outside of the range of 7-bit ASCII (a-z). If you are, add **useUnicode=yes;characterEncoding=utf8;** to the end of the extra connection properties, including the semi-colons.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Connect URL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                  |
| <pre>jdbc:mysql://localhost:3306/test</pre> <p>The Connect URL is JDBC-driver specific. It usually contains the address of the machine that the database is running on.<br/>The format of the MySQL connect URL is:<br/><b>jdbc:mysql://host:port/database</b><br/>With the three parameters (in bold)<br/><b>host</b>: The host name or IP address of the database server.<br/><b>port</b>: The port that the database server is running on. MySQL default port is <b>3306</b>.<br/><b>database</b>: The name of the logical database that you are connecting to on the MySQL server.</p> |                                                                                                                                  |
| Username                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | root                                                                                                                             |
| Password                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | .....                                                                                                                            |
| Password                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | .....                                                                                                                            |
| Extra Connection Properties                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                  |
| <pre>zeroDateTimeBehavior=CONVERT_TO_NULL;connectTimeout=120000;socketTimeout=120000;useSSL=false;allowPublicKeyValidation=false</pre> <p>There is an extensive list of extra connection properties available for MySQL Connector/J. See the documentation for a table describing all connection properties.<br/>A default <code>serverTimezone</code> value (taken from the gateway) will be appended to the connection string if one is not specified.</p>                                                                                                                               |                                                                                                                                  |
| Enabled                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <input checked="" type="checkbox"/> Disabling a connection will prevent communication to the target database.<br>(default: true) |
| Failover Datasource                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | - none -                                                                                                                         |
| <p>Another datasource that will be used to handle queries if this datasource faults.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                  |

7. Click on **Create New Database Connection** at the bottom of the form. Your connection is now created and the Database Connections page is displayed showing the **Status** of your connection as **Valid**.

| Name  | Description | JDBC Driver      | Translator | Status |
|-------|-------------|------------------|------------|--------|
| MySQL |             | MySQL ConnectorJ | None       | Valid  |

→ Create new Database Connection...

**Note:** For details about a connection's status, see the Database Connection Status page.

8. To display the details about the status of your database connection, see the **Note** on the above window and click on the **Database Connection Status** link. This will display any errors if your status is Faulted, in this example it shows the status as being Valid.

The screenshot shows the Ignition software interface. The left sidebar has a dark blue background with white text. It includes links for Home, Status (which is highlighted), Config, SYSTEMS (Overview, Performance, Alarm Pipelines, Gateway Scripts, Modules, Redundancy, Reports, SFCs, Tags, Transaction Groups), and CONNECTIONS (Databases, Designers, Devices, Gateway Network, Store & Forward, OPC Connections, Perspective Sessions, Vision Clients). The main content area has a light gray background. At the top, it says "Status > Connections > Databases". On the right, there's a "Get Designer" button. Below this, there are two large boxes: "Valid Connections" showing "0 / 1" and "Total Throughput" showing "0.0 queries/sec". A "Configuration" button is located in the top right corner of the main content area. Below these boxes is a navigation bar with buttons for "«", "<", "1", "of 1", ">", and "»". Underneath is a search/filter bar with "Filter" and "View 20". A table follows, with columns: Name, Driver, Status, Connections, Throughput, Actions. One row is shown: MySQL, MySQL, Valid, 0 / 8, 0.0 queries/sec, and a "Details" button.

| Name  | Driver | Status  | Connections | Throughput      | Actions                 |
|-------|--------|---------|-------------|-----------------|-------------------------|
| MySQL | MySQL  | ✓ Valid | 0 / 8       | 0.0 queries/sec | <a href="#">Details</a> |

#### Related Topics ...

- [Connecting to Microsoft SQL Server Express](#)
- [Store and Forward](#)
- [OPC UA](#)
- [Designer](#)

# Connecting to Microsoft SQL Server Express

## SQL Server Connection Requirements

In order to get connected to SQL Server, you must have a Translator, a Driver, and a Connection. The Translator and Driver only needs to be installed once, and after that you can make as many connections as you want to any compatible SQL Server databases.

**Note:** When you Upgrade Ignition, any existing drivers are carried over. This means only a fresh install of Ignition will not have a SQL Server Connector.

## On this page...

- [SQL Server Connection Requirements](#)
- [Connect to Microsoft SQL Server](#)
- [Microsoft SQL Server Connection Guide](#)
- [Different Ways of Connecting to SQL Server](#)
- [Troubleshooting](#)
- [JDBC Drivers and Translators](#)

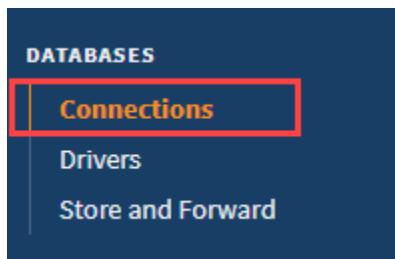


## Connecting to Microsoft SQL Server Express

[Watch the Video](#)

## Connect to Microsoft SQL Server

1. On the Gateway Webpage, go to the **Config** section.
2. Scroll down to **Databases > Connections**.



3. The Database Connections page is displayed. Click on **Create new Database Connection....**
4. Select **Microsoft SQLServer JDBC Driver**, and click **Next**.

The screenshot shows the Ignition Config interface. On the left, there's a sidebar with 'Config' selected. The main area is titled 'Database Connections'. It displays a list of database drivers: MariaDB, Microsoft SQLServer (which is selected and highlighted with a red border), MySQL, and Oracle Database.

5. On the **Database Connections** page, enter the following information:

Name: **SQLServer**

Connect URL: **jdbc:sqlserver://localhost\SQLEXPRESS**

**Note:** We are connecting to the express edition of SQL Server using the default instance name. If you have the full SQL Server with default settings, replace SQLEXPRESS with MSSQLSERVER.

username: **sa**

password: **sqlserver** (password is what you entered during the SQL Server installation. For this example, password is **sqlserver**)

The screenshot shows the 'Main Properties' section of the Database Connections configuration. The 'Name' field is set to 'SQLServer'. The 'JDBC Driver' is set to 'Microsoft SQLServer'. The 'Connect URL' field contains 'jdbc:sqlserver://localhost\MSSQLSERVER'. Below it, the documentation specifies the format as **jdbc:sqlserver://host\instanceName[:port]**. The 'Username' field is set to 'sa', and the 'Password' field is set to 'sqlserver' (with a red border around the input field).

6. At the bottom of the form, click on **Create New Database Connection**.

Your connection is now created. The Database Connections page is displayed and will show the status of Reconnecting, then Valid.

Config > Database > Database Connections

Successfully created new Database Connection "SQLServer"

| Name      | Description | JDBC Driver         | Translator | Status       |                        |                      |
|-----------|-------------|---------------------|------------|--------------|------------------------|----------------------|
| DB        |             | MariaDB             | MySQL      | Valid        | <a href="#">delete</a> | <a href="#">edit</a> |
| SQLServer |             | Microsoft SQLServer | MSSQL      | Reconnecting | <a href="#">delete</a> | <a href="#">edit</a> |

→ Create new Database Connection...

Note: For details about a connection's status, see the [Database Connection Status page](#).

- To display the details about the status of your database connection, see the **Note** on the above window and click on the **Database Connection Status** link.

Status > Connections > Databases

Help ⓘ Get Designer

Valid Connections: 1 / 2

Total Throughput: 12.2 queries/sec

| Name      | Driver                          | Status  | Connections | Throughput       | Actions                 |
|-----------|---------------------------------|---------|-------------|------------------|-------------------------|
| SQLServer | Microsoft SQLServer JDBC Driver | ✓ Valid | 0 / 8       | 12.0 queries/sec | <a href="#">Details</a> |

## Microsoft SQL Server Connection Guide

This guide helps you with any difficulties you may have in getting the correct settings and parameters when connecting Ignition to Microsoft SQL Server, a popular and robust relational database.

### Multiple Instances of Database

Microsoft SQL Server supports multiple instances of the database running concurrently on the same computer. Each instance has its own name and set of system and user databases that are not shared between instances. Applications, such as Ignition, can connect to each instance on a computer in much the same way they connect to databases running on different computers. By default, each instance gets assigned a dynamic TCP/IP port on startup that listens for any incoming requests. Since the port is dynamic and the application does not know what the new port is, it must connect using the instance name.

So if the communication is over TCP/IP and the application knows the instance name, how does the application find which port to communicate to?

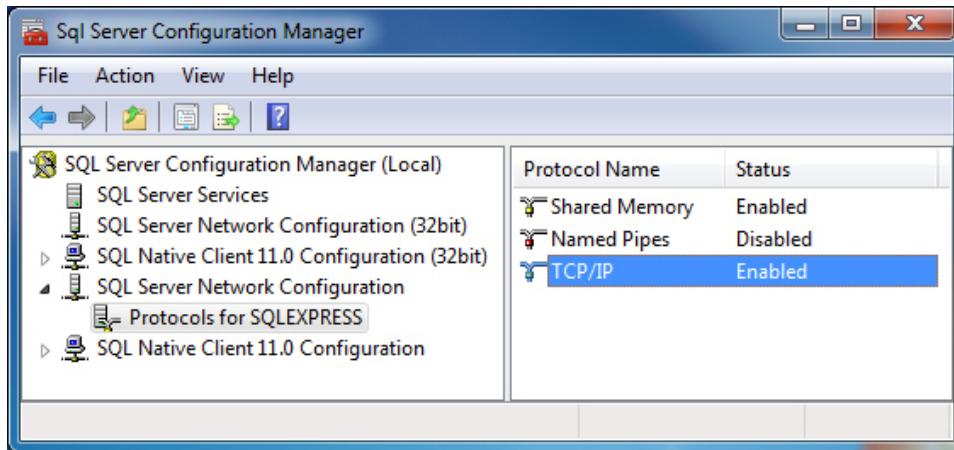
The answer is the **Microsoft SQL Server Browser** service. The Microsoft SQL Server Browser program runs as a Windows service and listens for all incoming requests for resources and provides information, such as the TCP/IP port, about each instance installed on the computer. Microsoft SQL Server Browser also contributes to these two actions: browsing a list of available servers and connecting to the correct server instance.

If the Microsoft SQL Server Browser service is not running, you can still connect to SQL Server if you provide the correct port number. For example, you can connect to the default instance of SQL Server with TCP/IP if it is running on port 1433.

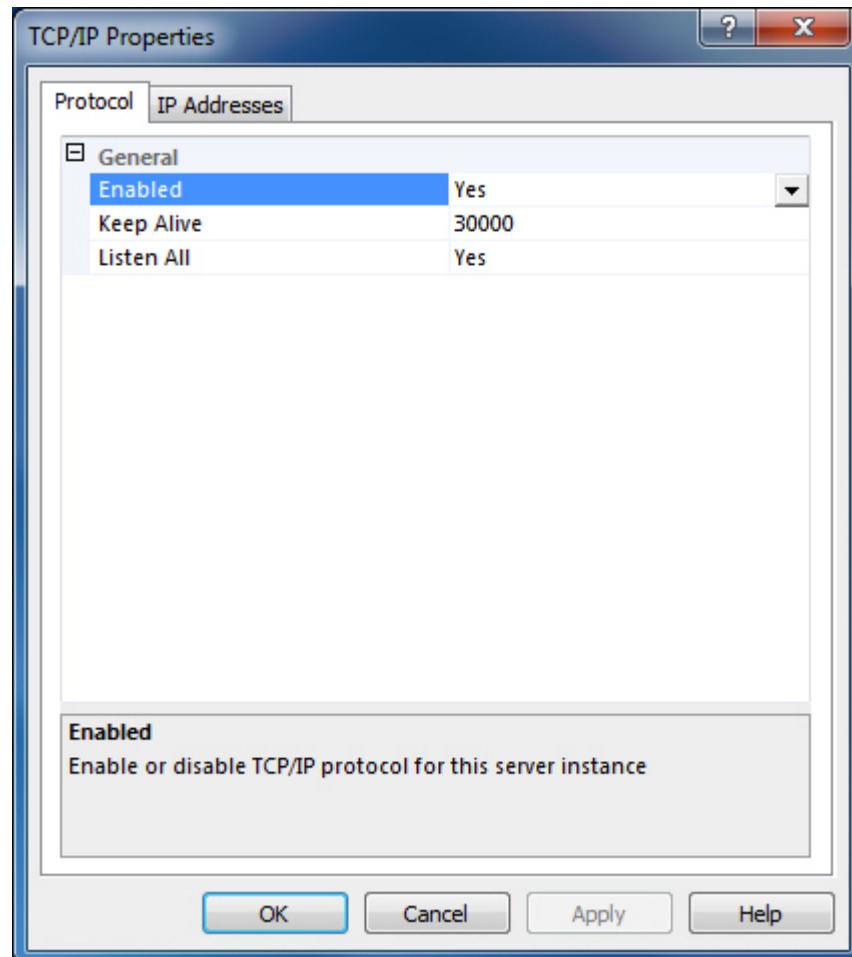
## Check 1: Make Sure the Database has TCP/IP Enabled

Ignition connects using TCP/IP, therefore make sure your database has TCP/IP enabled.

1. Open the SQL Server Configuration Manager from Start > All Programs > Microsoft SQL Server Version # > Configuration Tools > SQL Server Configuration Manager.  
The Sql Server Configuration Manager window is displayed.
2. To see all the instances setup on that machine, expand **SQL Server Network Configuration**.
3. Find the database (or instance) you plan on using. To the right, all of the protocols the database supports are shown. Find the **TCP/IP** protocol and select it.



4. Make sure the **Status** next to TCP/IP is **Enabled**. If not, double-click **TCP/IP** and choose **Yes** from the drop-down next to Enabled and click **OK**.

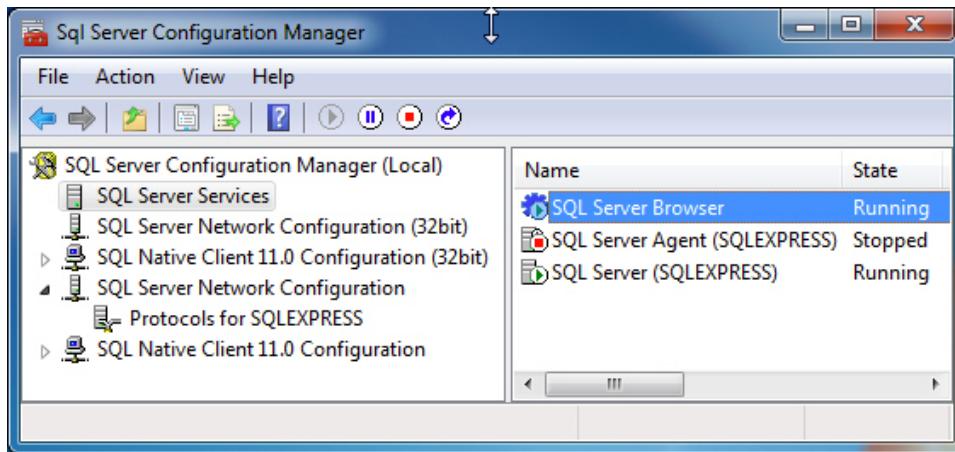


## Check 2: Make Sure Microsoft SQL Server Browser is Running

If you ARE connecting to your database using a NAMED INSTANCE, you must make sure that the Microsoft SQL Server Browser is running. As mentioned earlier, the Microsoft SQL Server Browser translates the instance name to a TCP/IP port in order for Ignition to connect to it.

1. Open the **SQL Server Configuration Manager** from **Start > All Programs > Microsoft SQL Server Version # > Configuration Tools > SQL Server Configuration Manager**.
2. Select the **SQL Server Services** section.
3. On the right, see all of the services installed. One of the services is **SQL Server Browser**. Make sure this service is in fact running. If the service is not running, right-click and select **Start**.

**Note:** The service could be disabled, so you may need to double-click it to enable the service before starting it up.



## Different Ways of Connecting to SQL Server

Now that you have ensured that TCP/IP is enabled and the Microsoft SQL Server Browser is running, you can connect to Microsoft SQL Server in four different ways (all using TCP/IP communication) as follows:

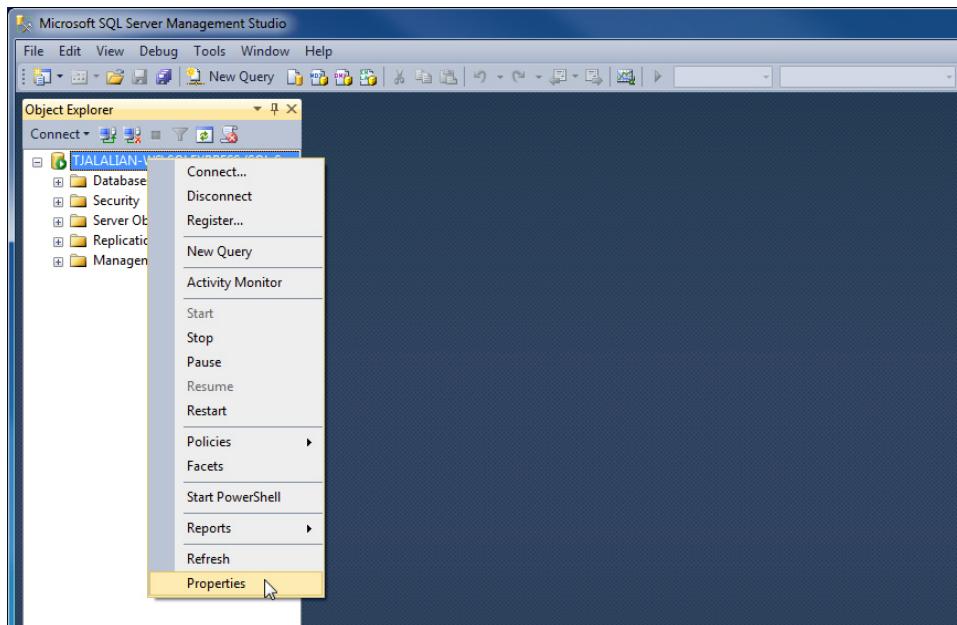
1. Connect using an Instance Name and SQL Authentication.
2. Connect using an Instance Name and Windows Authentication (this is the most common method).
3. Connect using a Port and SQL Authentication.
4. Connect using a Port and Windows Authentication.

### Scenario 1: Connect By Using an Instance Name and SQL Authentication

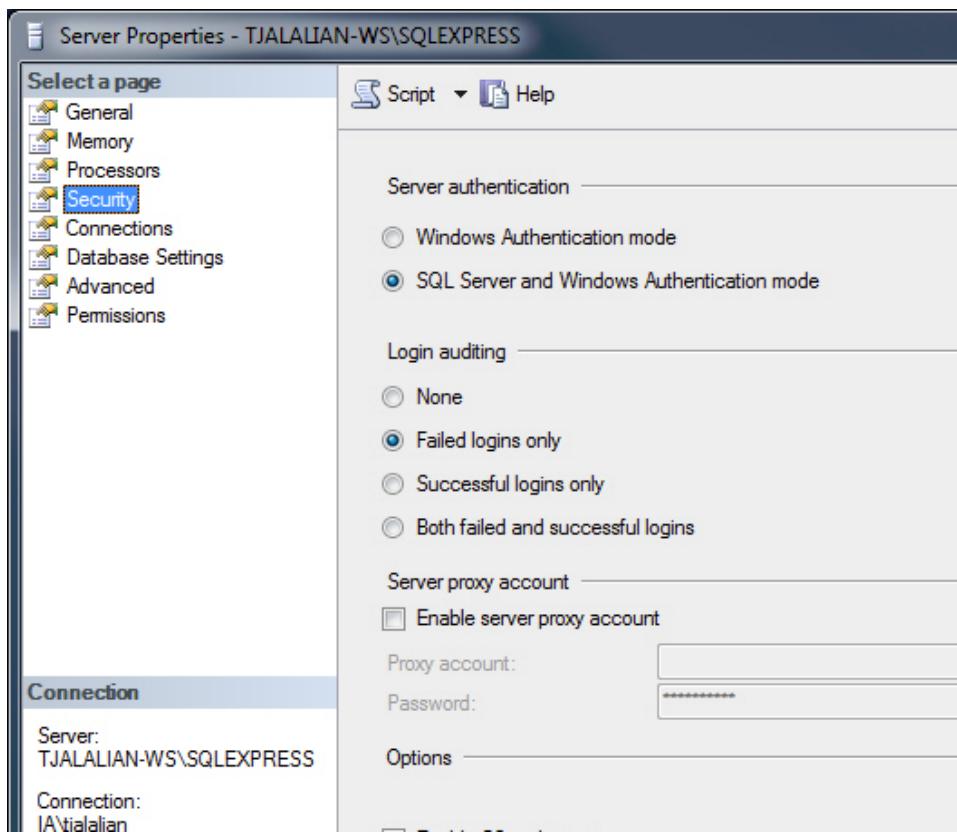
By default, Microsoft SQL Server only allows Windows authentication since it is more secure. But because we are using SQL authentication, we must enable Microsoft SQL to allow this type of authentication.

#### Enable SQL Authentication

1. Open the **Microsoft SQL Server Management Studio** window from **Start > All Programs > Microsoft SQL Server Version # > SQL Server Management Studio**.  
The window is displayed showing connections to your database.
2. Right-click the top-level database in the **Object Explorer** and select **Properties**.



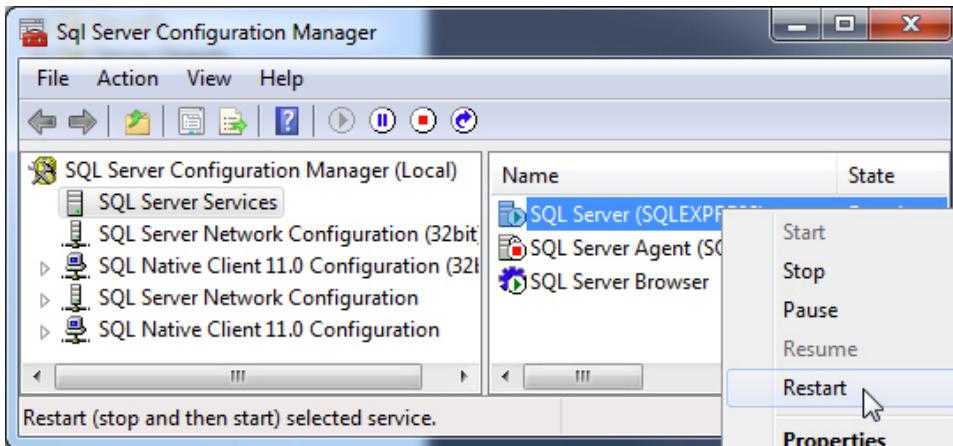
3. From the Server Properties window, on the left side, select **Security**.



4. Verify that **SQL Server and Windows Authentication mode** is selected.  
If not, select it and click **OK**.

Now you need to restart the **SQL Server Windows** service so that this setting takes effect.

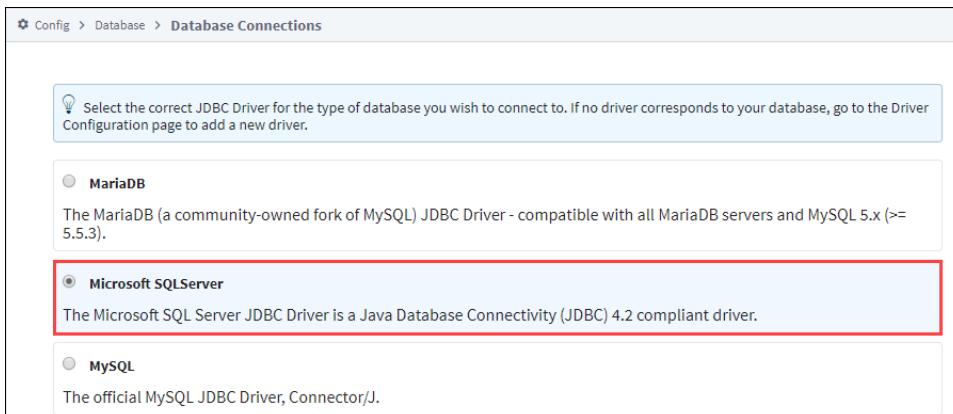
5. Open the **SQL Server Configuration Manager** at  
**Start > All Programs > Microsoft SQL Server Version # > Configuration Tools > SQL Server Configuration Manager**.
6. Select the **SQL Server Services** section and restart the **SQL Server (Instance Name)** item.



Now that Microsoft SQL Server accepts SQL authentication, we can configure Ignition.

### Configure the Database Connection in Ignition

1. Go to and login to the Ignition Gateway Config page from your webbrowser at <http://hostname:8088/main/web/config/>
2. Select **Databases > Connections** from the menu.
3. Click on **Create new Database Connection**.
4. Select **Microsoft SQL Server JDBC Driver** and click **Next**.



5. In the **New Database Connection** window, enter the following information:

Name: **SQLServer\_SQLAuth** (no spaces)

Connect URL: **jdbc:sqlserver://Hostname\InstanceName**

where **Hostname** is your databases IP address or hostname and **InstanceName** is your databases instance name, for example:  
**jdbc:sqlserver://localhost\SQLEXPRESS**  
**jdbc:sqlserver://10.10.1.5\MSSQLSERVER**

6. Set the username and password to a valid SQL authentication user. For example, **sa** is the default administrator account you can use.

Config > Database > Database Connections

| Main Properties             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name                        | <input type="text" value="SQLServer_SQLAuth"/> <a href="#">[i]</a><br>Choose a name for this database connection.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Description                 | <input type="text"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| JDBC Driver                 | Microsoft SQLServer <a href="#">[▼]</a><br>The JDBC driver dictates the type of database that this connection can connect to. It cannot be changed once created.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Connect URL                 | <input type="text" value="jdbc:sqlserver://localhost\SQLEXPRESS"/> <a href="#">[i]</a><br>The Connect URL is JDBC-driver specific. It usually contains the address of the machine that the database is running on.<br>The format of the SQL Server connect URL is:<br><code>jdbc:sqlserver://host\instanceName[:port]</code><br>With the three parameters (in bold)<br><b>host</b> : The host name or IP address of the database server.<br><b>instanceName</b> : (optional) the instance to connect to on the host. If not specified, a connection to the default instance is made.<br><b>port</b> : (optional) the port to connect to. The default is <b>1433</b> . If you are using the default, you can omit the port and the preceding ':'.<br>For SQL Server, you specify the <i>database name</i> to connect to using the <code>databaseName</code> property in the <i>Extra Connection Properties</i> . |
| Username                    | <input type="text" value="sa"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Password                    | <input type="password" value="....."/> <a href="#">[i]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Password                    | <input type="password" value="....."/> <a href="#">[i]</a><br>Re-type password for verification.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Extra Connection Properties | <input type="text" value="databaseName=test"/> <a href="#">[i]</a><br>Use <code>databaseName=YOUR_DATABASE</code> to specify the database to connect to.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

7. To add your own user account, open the SQL Server Management Studio and expand the **Security > Logins** folder. You will see all the current logins including **sa** and you can add a new login.

- To add a new login, right-click on the **Logins** folder and click **New Login...**.  
The **Login** window is displayed.
- Choose the **SQL Server authentication** mode and type in a Login name and password.

**Note:** You will also have to add permissions to your database by mapping `db_datareader` and `db_datawriter` to the new user in the User Mapping section of the Login window. If you want Ignition to be able to create tables (ie: for Tag History), you also need to give table creation access such as `db_owner`.

- Go back to the **New Database Connection** page in the Gateway, enter the name of your database, for example, in the **Extra Connection Properties** enter: `databaseName=test` (replace **test** with your database name, not the instance name).
- Click **Create New Database Connection**.  
The Database Connection page is displayed showing the Status as **Valid** after a couple of seconds. If the connection is **Faulted**, click on the Database Connection Status link to find out why. Typically, the username/password is incorrect or the user doesn't have the right permissions.

## Scenario 2: Connect By Using Instance Name and Windows Authentication

In Windows authentication mode, the username and password used to connect comes from the Ignition Windows Service logon. By default, the Ignition Windows Service is set to local system account which usually doesn't have privileges to connect.

### Set Up the Service to Use Windows Authentication

- Download a copy of the **SQL Server JDBC driver**. Specifically, download a ZIP or tar.gz file (NOT an installer), as you will need to extract a specific file and relocate it to the gateway's installation directory. The exact version required depends on the version of Java your gateway is using. Ignition 8.0 uses Java 11, but future updates could change the java version. Regardless, it's recommended you use the most recent driver available for your system.
- Locate the `mssql-jdbc-auth-#.#.x##.dll` file from the correct architecture folder ("x64" for 64-bit JDBC) inside of the `enu/auth` folders in the zip file.

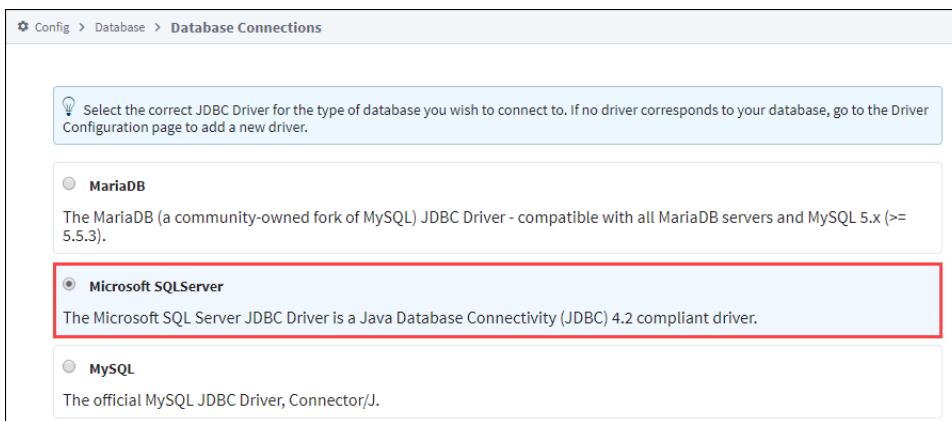
3. Copy the `sqljdbc_auth.dll` file to the **lib** folder in your install directory. If you have the default install directory, it's in the following location:  
**C:\Program Files\Inductive Automation\Ignition\lib\**

**Note:** Older version of the JDBC driver (such as version 7.2.1) needed to be renamed to `sqljdbc_auth.dll` before Ignition could utilize the file. However, in more modern version of the driver, this is no longer the case.

4. The account used to connect will be the account that Ignition is running under in the services menu. To setup Ignition to logon using the right Windows account, open the **Services Control Panel** from Start > Control Panel > Administrative Tools > Services
5. Right-click the **Ignition** service and choose **Properties**.
6. Select the **Log On** tab.
7. Choose the **This account** radio button and enter in your Windows username and password.
8. Click **OK** to save.
9. Now restart the Ignition service to make this change take effect. Click the **Action > Restart** button in the menubar to restart the Ignition service (or you can stop and start from the right-click menu).

## Configure the Database Connection in Ignition

1. Go to and login to the Ignition Gateway Config page from your webbrowser at <http://hostname:8088/main/web/config>
2. Select **Databases > Connections** from the menu.
3. Click on **Create new Database Connection**.
4. Select **Microsoft SQL Server JDBC Driver** and click **Next**.



5. On the **New Database Connection** page, enter the following information:  
Name: **SQLServer\_WinAuth** (no spaces)

Connect URL: `jdbc:sqlserver://Hostname\InstanceName`

where **Hostname** is your databases IP address or hostname and **InstanceName** is your databases instance name, for example:  
`jdbc:sqlserver://localhost\SQLEXPRESS`  
`jdbc:sqlserver://10.10.1.5\MSSQLSERVER`

**username:** leave blank  
**password:** leave blank

Extra Connection Properties:  
`databaseName=test; integratedSecurity=true;` (replace test with your database name)

Config > Database > Database Connections

| Main Properties             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name                        | <input type="text" value="SQLServer_WinAuth"/> <a href="#">[i]</a><br>Choose a name for this database connection.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Description                 | <input type="text"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| JDBC Driver                 | Microsoft SQLServer <a href="#">[▼]</a><br>The JDBC driver dictates the type of database that this connection can connect to. It cannot be changed once created.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Connect URL                 | <input type="text" value="jdbc:sqlserver://localhost\MSSQLSERVER"/><br>The Connect URL is JDBC-driver specific. It usually contains the address of the machine that the database is running on.<br>The format of the SQL Server connect URL is:<br><code>jdbc:sqlserver://host\instanceName[:port]</code><br>With the three parameters (in bold)<br><b>host</b> : The host name or IP address of the database server.<br><b>instanceName</b> : (optional) the instance to connect to on the host. If not specified, a connection to the default instance is made.<br><b>port</b> : (optional) the port to connect to. The default is <b>1433</b> . If you are using the default, you can omit the port and the preceding '!'.<br>For SQL Server, you specify the <i>database name</i> to connect to using the <code>databaseName</code> property in the <i>Extra Connection Properties</i> . |
| Username                    | <input type="text"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Password                    | <input type="password"/> <a href="#">[i]</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Password                    | <input type="password"/> <a href="#">[i]</a><br>Re-type password for verification.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Extra Connection Properties | <input type="text" value="databaseName=test;integratedSecurity=true"/><br>Use <code>databaseName=YOUR_DATABASE</code> to specify the database to connect to.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Enabled                     | <input checked="" type="checkbox"/> Disabling a connection will prevent communication to the target database.<br>(default: true)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Failover Datasource         | <input type="text" value="- none -"/> <a href="#">[▼]</a><br>Another datasource that will be used to handle queries if this datasource faults.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

6. Click on **Create New Database Connection**.

The Status should be Valid after a couple of seconds. Again, if the connection is Faulted, click the Database Connection Status link to find out why.

### Scenario 3: Connect By Using Port and SQL Authentication

1. Connecting by using a port and SQL authentication is just like scenario 1 above except you specify a port instead of the instance name in the **New Database Connection** page.
2. Enter the following:

Connect URL: `jdbc:sqlserver://Hostname:Port`

where **Hostname** is your databases IP address or hostname and **Port** is your databases TCP/IP port (SQLSERVER default port is 1433), for example:

`jdbc:sqlserver://localhost:1433`  
`jdbc:sqlserver://10.10.1.5:1433`

### Scenario 4: Connect By Using Port and Windows Authentication

Connecting by using a port and Windows authentication is just like scenario 2 above except you specify a port instead of the instance name in the **New Database Connection** page. Don't forget to download the `sqljdbc_auth.dll` file if you need it.

Enter the following:

Connect URL: `jdbc:sqlserver://Hostname:Port`

where **Hostname** is your databases IP address or hostname and **Port** is your databases TCP/IP port (SQLSERVER default port is 1433), for example:  
`jdbc:sqlserver://localhost:1433`  
`jdbc:sqlserver://10.10.1.5:1433`

## Troubleshooting

### TCP/IP Communication Not Enabled

SQL Server requires that you explicitly turn on TCP connectivity. To do this, use the SQL Server Configuration Manager, located in the **Start** menu under **Microsoft SQL Server > Configuration Tools**. Under **SQL Server Network Configuration**, select your instance, and then enable TCP/IP in the panel to the right. You need to restart the server for the change to take affect.

### Window Firewall

When connecting remotely, make sure that Windows Firewall is disabled, or set up to allow the necessary ports. Normally ports 1434 and 1433 must be open for TCP traffic, but other ports may be required based on configuration.

### SQL Server Browser Process Not Running

To connect to a named instance, the **SQL Server Browser** service must be running. It is occasionally disabled by default, so you need to verify that the service is not only running, but set to start automatically on bootup. The service can be found in the Windows Service Manager (**Control Panel > Administrative Tools > Services**).

### Mixed Mode Authentication Not Enabled

Unless selected during setup, **mixed mode** or **SQL authentication** is not enabled by default. This mode of authentication is the **username/password** scheme that most users are used to. When not enabled, SQL Server only allows connections using Windows Authentication. Due to the ease of using SQL Authentication over Windows Authentication, we recommend enabling this option and defining a user account for Ignition.

1. To enable this, open the SQL Server Management Studio.
2. Connect to the server.
3. Right click on the instance and select **Properties**.
4. Under **Security**, select **SQL Server and Windows Authentication mode**.

## JDBC Drivers and Translators

In some cases, you may need to add your own JDBC Driver, or configure a Translator. More information on configuring these can be found on the [JDBC Drivers and Translators](#) page. However, you may need to check the JDBC driver's documentation for information on how to configure them.

### Related Topics ...

- [Connecting to Oracle Express](#)
- [Store and Forward](#)
- [OPC UA](#)
- [Designer](#)

# Connecting to Oracle Express

This page documents how to configure a database connection to an Oracle Express instance.

## Oracle User Grants

When using an Oracle Express database connection, it is required to provide user credentials that have grants for "CREATE TRIGGER" and "CREATE SEQUENCE". Some of Ignition's subsystems, such as the [Tag Historian](#), will fail to work properly if the user defined in the Database Connection does not have these grants. In addition, any manual queries (for example, those called by `system.db.runNamedQuery`) that need to insert records or create sequences may fail if the gateway does not have the grants.

## On this page ...

- [Oracle User Grants](#)
- [Connect Ignition to the Oracle Express Database](#)
- [JDBC Drivers and Translators](#)

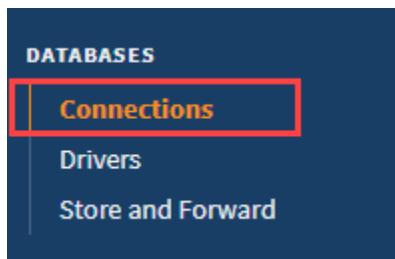


## Connecting to Oracle Express

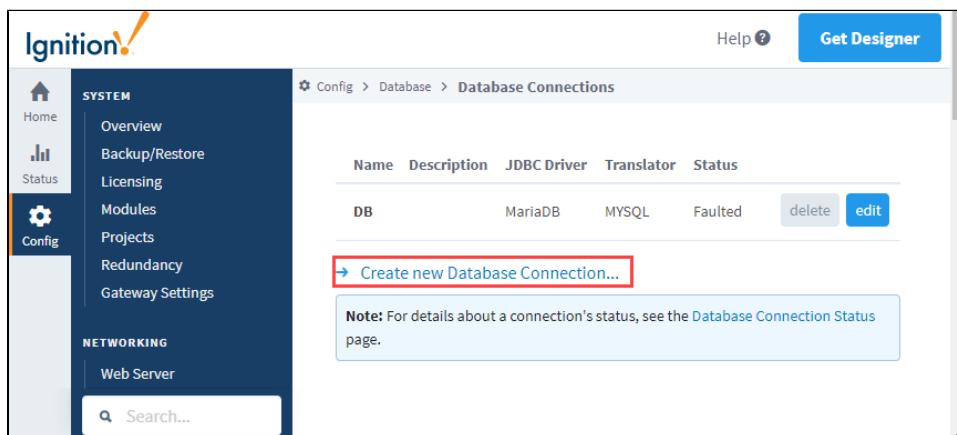
[Watch the Video](#)

## Connect Ignition to the Oracle Express Database

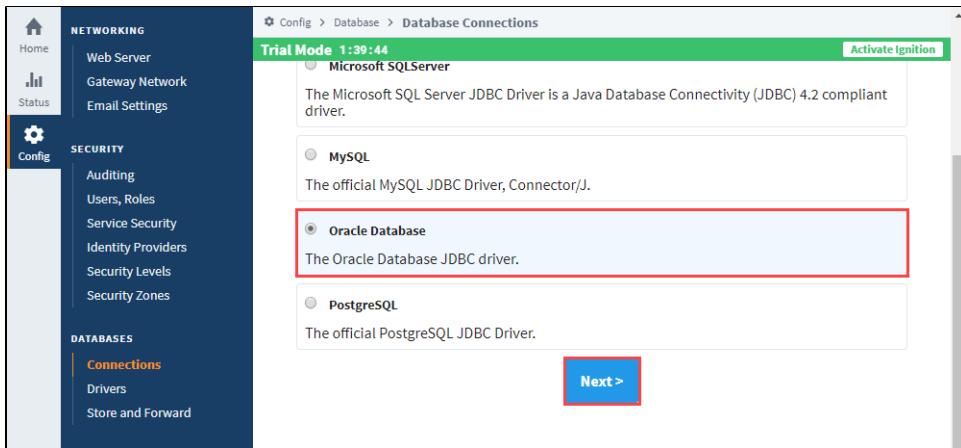
1. On the Gateway Webpage, go to the **Config** section.
2. Scroll down to **Databases > Connections**.



3. The Database Connections page is displayed. Click on **Create new Database Connection...**



4. Select the **Oracle JDBC Driver** and click **Next**.



5. Enter the following information:

| Property Name | How should it be configured                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name          | The name of the database connection. Other features in Ignition will reference this connection by the name specified here.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Connect URL   | <p>A URL that describes where on the network the database is, as well as information about which schema to connect to. The initial value should look something like the following</p> <pre>jdbc:oracle:thin:@localhost:1521:XE</pre> <p>However, you may need to make some changes. If we examine the key pieces of the URL, it would look like this:</p> <pre>jdbc:oracle:thin://1:2:3</pre> <p>Where:</p> <ul style="list-style-type: none"> <li>1 = The IP Address or hostname of the computer/server that the database is installed on.</li> <li>2 = The port that the database is running on. The default is 1521, but this could have been changed during installation, or sometime afterwards. When in doubt, ask the person that installed the database.</li> <li>3 = The System ID for the database. More information on the System ID can be found in Oracle's documentation.</li> </ul> |
| Username      | The username that the Gateway will use to connect to the database.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Password      | The password for the user specified under the Username property.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

For our example, we entered information relevant to our installation. The values seen below may differ from each installation.

The screenshot shows the Ignition Config interface with the 'Config' tab selected. In the left sidebar, under 'DATABASES', 'Connections' is highlighted. The main content area shows the 'Database Connections' page. A red box highlights the 'Name' field, which contains 'Oracle'. Another red box highlights the 'Password' field, which contains '.....' and has a note below it: 'Re-type password for verification.'

6. Click **Create New Database Connection** at the bottom of the form.
7. The Database Connections page is displayed showing the **Status** of your connection as **Valid**.

The screenshot shows the Ignition Config interface with the 'Config' tab selected. In the left sidebar, under 'DATABASES', 'Connections' is highlighted. The main content area shows the 'Database Connections' page. A green success message at the top says 'Successfully created new Database Connection "Oracle"'. The table lists two connections: MySQL and Oracle. The Oracle connection's 'Status' column is highlighted with a red box and shows 'Valid'.

8. To display the details about the status of your database connection, see the **Note** on the above window and click on the **Database Connection Status** link.

The screenshot shows the Ignition Config interface with the 'Config' tab selected. In the left sidebar, under 'DATABASES', 'Connections' is highlighted. The main content area shows the 'Database Connection Status' page. It displays 'Valid Connections: 1 / 1' and 'Total Throughput: 0.1 queries/sec'. Below is a table:

| Name   | Driver             | Status                                     | Connections | Throughput      |                                                                                                             |
|--------|--------------------|--------------------------------------------|-------------|-----------------|-------------------------------------------------------------------------------------------------------------|
| Oracle | Oracle JDBC Driver | <span style="color: green;">✓ Valid</span> | 0 / 8       | 0.1 queries/sec | <span style="background-color: #0070C0; color: white; border-radius: 5px; padding: 2px 5px;">Details</span> |

## JDBC Drivers and Translators

In some cases, you may need to add your own JDBC Driver, or configure a Translator. More information on configuring these can be found on the [JDBC Drivers and Translators](#) page.

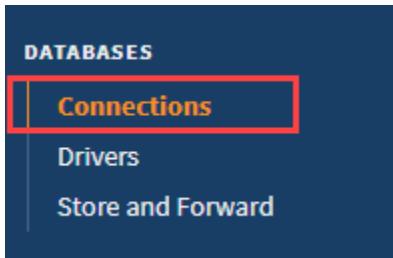
Related Topics ...

- [Store and Forward](#)
- [OPC UA](#)
- [Designer](#)

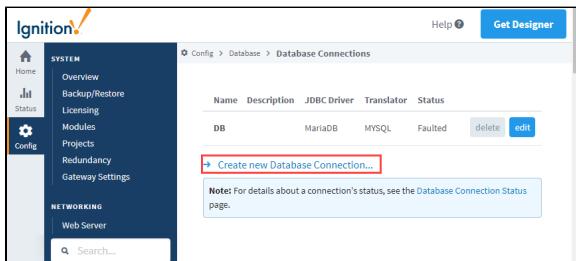
# Connecting to PostgreSQL

## Connect Ignition to the PostgreSQL Database

1. On the Gateway Webpage, go to the **Config** section.
2. Scroll down to **Databases > Connections**.



3. The Database Connections page is displayed. Click on **Create new Database Connection....**



4. Select the **PostgreSQL JDBC Driver** and click **Next**.



5. Next, you'll need to enter information that will allow the Gateway to connect to a Postgres instance. In most cases, the following properties should be updated:

| Property Name | How should it be configured                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name          | The name of the database connection. Other features in Ignition will reference this connection by the name specified here.                                                                                                                                                                                                                                                                                                |
| Connect URL   | A URL that describes where on the network the database is, as well as information about which schema to connect to. The initial value should look something like the following<br><br><code>jdbc:postgresql://localhost:5432/schema</code><br><br>However, you may need to make some changes. If we examine the key pieces of the URL, it would look like this:<br><br><code>jdbc:postgresql://1:2/3</code><br><br>Where: |

## On this page ...

- Connect Ignition to the PostgreSQL Database
- JDBC Drivers and Translators



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## Connecting to PostgreSQL

[Watch the Video](#)

|          |                                                                                                                                                                                                                                                                                                                                                                                  |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | <p>1 = The IP Address or hostname of the computer/sever that Postgres is installed on</p> <p>2 = The port that Postgres is running on. The default is 5432, but this could have been changed during installation, or sometime afterwards. When in doubt, ask the person that installed the database.</p> <p>3 = The schema name that this connection will provide access to.</p> |
| Username | The username that the Gateway will use to connect to the database.                                                                                                                                                                                                                                                                                                               |
| Username | The username that the Gateway will use to connect to the database.                                                                                                                                                                                                                                                                                                               |

6. Click **Create New Database Connection** at the bottom of the form.
7. The Database Connections page is displayed showing the **Status** of your connection as **Valid**.
8. To display the details about the status of your database connection, see the **Note** on the above window and click on the **Database Connection Status** link.

## JDBC Drivers and Translators

In some cases, you may need to add your own JDBC Driver, or configure a Translator. More information on configuring these can be found on the [JDBC Drivers and Translators](#) page.

### Related Topics ...

- [Store and Forward](#)
- [OPC UA](#)
- [Designer](#)

# Connecting to SQLite

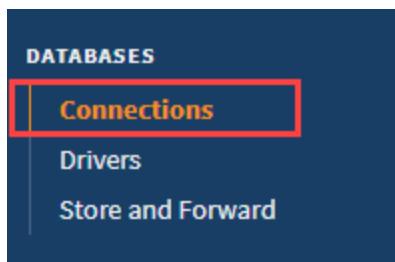
An Ignition Gateway can create a SQLite database, allowing for data collection without installing a separate SQL database. This is ideal for small scale applications, as well as testing and demonstrations.

SQLite connections offer convenience, but Relational Database Management Systems (RDBMS) generally offer better performance, especially so in cases where queries are frequently executed such as systems utilizing a historian system. As a result, the SQLite connection is **not** recommended for production systems as a historian database. Learn more about appropriate uses of SQLite in their [official documentation](#).

Unlike other database connections, SQLite databases only support a single connection at a time. Configuring this type of Database Connection means the Gateway will constantly be connected to the SQLite database, preventing other systems from connecting.

## Connect Ignition to SQLite Database

1. On the Gateway Webpage, go to the **Config** section.
2. Scroll down to **Databases > Connections**.



3. The Database Connections page is displayed. Click on **Create new Database Connection....**

A screenshot of the 'Database Connections' page. The left sidebar shows the 'Config' section selected. The main area displays a table of connections with two entries: 'DB' (MariaDB, MySQL, Faulted) and 'MSSQL' (MySQL, MySQL, Valid). A red box highlights the 'Create new Database Connection...' button. A note below it says: 'Note: For details about a connection's status, see the [Database Connection Status](#) page.'

| Name  | Description | JDBC Driver | Translator | Status  | Actions                                       |
|-------|-------------|-------------|------------|---------|-----------------------------------------------|
| DB    |             | MariaDB     | MySQL      | Faulted | <button>delete</button> <button>edit</button> |
| MSSQL |             | MySQL       | MySQL      | Valid   | <button>delete</button> <button>edit</button> |

4. Select the **SQLite** driver and click **Next**.

The screenshot shows the 'Database Connections' configuration page. It lists several database drivers: MySQL, Oracle Database, Oracle JDBC, PostgreSQL, and SQLite. The 'SQLite' option is selected, indicated by a red border around its box. Below the list is a blue 'Next >' button.

- On the **New Database Connection** page, enter a name for your connection. We used **SQLite\_Connect**.
- Next, enter the connect URL for the database. For SQLite this setting must lead to a location on a filesystem. In our example here we used **jdbc:sqlite:C:Program Files/SQLite/File.db**. This path ultimately must lead to a local directory, or a locally mapped drive.



The JDBC Driver for SQLite will attempt to create a database if one does not already exist.



For Windows machines, either forward / or backslashes\ can be used.

The screenshot shows the 'New Database Connection' form under the 'Main Properties' tab. The 'Name' field contains 'SQLite\_Connect' (highlighted with a red box). The 'Description' field contains 'My SQLite connection'. The 'JDBC Driver' dropdown is set to 'SQLite'. The 'Connect URL' field contains 'jdbc:sqlite:C:/Program Files/SQLite/File.db' (highlighted with a red box). Below the URL, it says: 'The Connect URL is JDBC-driver specific. It usually contains the address of the machine that the database is running on. The format of the SQLite connect URL is:'. It then shows examples: 'jdbc:sqlite:/Path/To/File.db', 'jdbc:sqlite:/path/on/linux/File.db', and 'jdbc:sqlite::memory'.

- Click on **Create New Database Connection** at the bottom of the form.

Your connection is now created and the Database Connections page is displayed showing the **Status** of your connection as **Valid**.

Config > Database > Database Connections

Successfully created new Database Connection "SQLite\_Connect"

| Name           | Description | JDBC Driver         | Translator | Status       |                        |                      |
|----------------|-------------|---------------------|------------|--------------|------------------------|----------------------|
| DB             |             | MariaDB             | MYSQL      | Faulted      | <a href="#">delete</a> | <a href="#">edit</a> |
| MSSQL          |             | MySQL               | MYSQL      | Valid        | <a href="#">delete</a> | <a href="#">edit</a> |
| SQLServer      |             | Microsoft SQLServer | MSSQL      | Reconnecting | <a href="#">delete</a> | <a href="#">edit</a> |
| SQLite_Connect |             | SQLite              | SQlite     | Valid        | <a href="#">delete</a> | <a href="#">edit</a> |

[Create new Database Connection...](#)

**Note:** For details about a connection's status, see the [Database Connection Status](#) page.

#### Related Topics ...

- [Connecting to Microsoft SQL Server Express](#)
- [Store and Forward](#)
- [OPC UA](#)
- [Designer](#)

# JDBC Drivers and Translators

In most cases, the default JDBC drivers and Translator settings in Ignition will not need to be modified. However, there are cases where drivers or translators may need modification.

## JDBC Drivers and Ignition Upgrades

When upgrading Ignition, JDBC drivers are **not** modified during the upgrade process. This is to prevent database connection issues on upgrade: you should only need to upgrade your JDBC drivers when the database is updated, not when Ignition is upgraded. Only new Ignition installations will always use the JDBC drivers that are included with the installer.

Running the installer to upgrade a preexisting Ignition installation will not modify the installed JDBC drivers, even if newer drivers are included in the installer. In addition, restoring a Gateway backup from an older version will replace any new versions of the drivers with the versions from the backup. In this case, you will need to manually update the JDBC drivers.

## On this page ...

- [JDBC Drivers and Ignition Upgrades](#)
- [MySQL Translator and JDBC Driver Settings](#)
- [MSSQL Translator and JDBC Driver Settings](#)
- [Oracle Express Translator and JDBC Driver Settings](#)
- [PostgreSQL Translator and JDBC Driver Settings](#)
- [Add a New JDBC Driver](#)
- [Upgrade a JDBC Driver](#)
- [Database Translators](#)

Commonly, you will have to download the official JAR file from the creator's website. We have a few links here to make it easy to find.

| Database   | Link                                                                                                                                                                                                      | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MySQL      | <a href="https://dev.mysql.com/downloads/connector/j/">https://dev.mysql.com/downloads/connector/j/</a>                                                                                                   | <ol style="list-style-type: none"><li>1. Select Your Operating system (or <b>Platform Independent</b> if you are on Windows).</li><li>2. After the file has been downloaded, unzip the archive. On Windows you can right-click and select the <b>Extract All</b> option.</li><li>3. The location of the JAR we need should be in the extracted folder under <b>mysql-connector-java-X.X.XX</b> where the Xs are the version number. You are looking for a file that is named like <b>mysql-connector-java-X.X.XX.jar</b>.</li></ol> |
| MSSQL      | <a href="https://github.com/microsoft/mssql-jdbc/releases">https://github.com/microsoft/mssql-jdbc/releases</a>                                                                                           | You only need the .jar file, so you can select just the <b>mssql-jdbc-X.X.XX.jre11.jar</b> file. The Xs will be replaced with the version numbers. Ensure you download the <b>jre11</b> version of the JAR.                                                                                                                                                                                                                                                                                                                         |
| Oracle     | <a href="https://www.oracle.com/technetwork/database/application-development/jdbc/downloads/index.html">https://www.oracle.com/technetwork/database/application-development/jdbc/downloads/index.html</a> | <ol style="list-style-type: none"><li>1. You will need to create an Oracle account to download the JAR files.</li><li>2. You can select the Unzipped version of the newest JAR.</li><li>3. You are looking for a file that is named like <b>odbcX.jar</b>. Where X is the version number.</li></ol>                                                                                                                                                                                                                                 |
| PostgreSQL | <a href="https://jdbc.postgresql.org/download.html">https://jdbc.postgresql.org/download.html</a>                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## MySQL Translator and JDBC Driver Settings

MySQL connections can often use the included MariaDB translator, but we recommend using a separate MySQL Translator. However, you may need to check the JDBC driver's documentation for information on how to configure them. Below are some recommended settings, but the vendor's documentation should always supersede any suggestions here.

| Main Properties                 |                                                         |
|---------------------------------|---------------------------------------------------------|
| Name                            | MySQL                                                   |
| Create Table Syntax             | CREATE TABLE {tablename} ({creationdef}{primarykeydef}) |
| Create Sequence Syntax          | <leave empty>                                           |
| Create Trigger Syntax           | <leave empty>                                           |
| Create Index Syntax             | CREATE INDEX {indexname} ON {tablename}({columnname})   |
| Auto Increment Field Definition | {type} NOT NULL AUTO_INCREMENT                          |
| Alter Table Syntax              | ALTER TABLE {tablename} {alterdef}                      |
| Add Column Syntax               | ADD COLUMN {columnname} {type}                          |

|                                         |                            |
|-----------------------------------------|----------------------------|
| Primary Key Syntax                      | PRIMARY KEY ({columnname}) |
| Limit Syntax                            | LIMIT {limit}              |
| Limit Position                          | Back                       |
| Current Timestamp Query                 | SELECT CURRENT_TIMESTAMP   |
| Column Quote Character                  | '                          |
| Supports Returning Auto-generated Keys? | True                       |
| Fetch Key Query                         | <leave empty>              |
| Table List Filter                       | <leave empty>              |
| <b>Data Type Mapping</b>                |                            |
| Byte (I1)                               | int                        |
| Short (I2)                              | int                        |
| Integer (I4)                            | int                        |
| Long (I8)                               | bigint                     |
| Boolean                                 | int                        |
| Datetime                                | datetime                   |
| Float (R4)                              | float(10)                  |
| Double (R8)                             | double                     |
| String                                  | varchar(255)               |
| Binary                                  | varbinary                  |
| Long Text                               | text                       |

| Main Properties                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name                           | MySQL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Description                    | The official MySQL JDBC Driver, Connector/J.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Class Name                     | com.mysql.cj.jdbc.Driver                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| JAR File(s)                    | <Click on the <b>Choose File</b> button to select and upload the JAR(s). This is the part where you upload the JDBC driver. >                                                                                                                                                                                                                                                                                                                                                                                                          |
| Driver Defaults & Instructions |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Driver Type                    | MySQL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| URL Format                     | jdbc:mysql://localhost:3306/test                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| URL Instructions               | <br/>The format of the MySQL connect URL is:<br><code>jdbc:mysql://<b>host</b>:<b>port</b>/<b>database</b></code><br/>With the three parameters (in bold) <ul style="list-style-type:none; margin-left:10px;"><li><b>host</b>: The host name or IP address of the database server.</li><li><b>port</b>: The port that the database server is running on. MySQL default port is <b>3306</b>.</li><li><b>database</b>: The name of the logical database that you are connecting to on the MySQL server.</li></ul>                        |
| Default Connection Properties  | zeroDateTimeBehavior=CONVERT_TO_NULL;connectTimeout=120000;socketTimeout=120000;useSSL=false;allowPublicKeyRetrieval=true;                                                                                                                                                                                                                                                                                                                                                                                                             |
| Connection Proper              | There is an extensive list of extra connection properties available for MySQL Connector/J. See <a href='the'> <a href="http://dev.mysql.com/doc/connectors/en/connector-j-reference-configuration-properties.html">http://dev.mysql.com/doc/connectors/en/connector-j-reference-configuration-properties.html</a> </a> for the documentation for a table describing all connection properties.<br/>A default <tt>serverTimezone</tt> value (taken from the Gateway) will be appended to the connection string if one is not specified. |

|                                    |          |
|------------------------------------|----------|
| ties<br>Instruc<br>tions           |          |
| Default<br>Validat<br>ion<br>Query | SELECT 1 |
| <b>SQL Language Compatibility</b>  |          |
| Default<br>Transl<br>ator          | MySQL    |

## MSSQL Translator and JDBC Driver Settings

In some cases, you may need to add your own JDBC Driver, or configure a Translator. However, you may need to check the JDBC driver's documentation for information on how to configure them. Below are some recommended settings, but the vendor's documentation should always supersede any suggestions here.

| Main Properties                         |                                                                                                        |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------|
| Name                                    | <Name of the Translator. The JDBC driver will reference the settings below by the name specified here> |
| Create Table Syntax                     | CREATE TABLE {tablename} ({creationdef}{primarykeydef})                                                |
| Create Sequence Syntax                  | <Blank>                                                                                                |
| Create Trigger Syntax                   | <Blank>                                                                                                |
| Create Index Syntax                     | CREATE INDEX {indexname} ON {tablename}({columnname})                                                  |
| Auto Increment Field Definition         | {type} IDENTITY(1,1)                                                                                   |
| Alter Table Syntax                      | ALTER TABLE {tablename} ADD {alterdef}                                                                 |
| Add Column Syntax                       | {columnname} {type}                                                                                    |
| Primary Key Syntax                      | PRIMARY KEY CLUSTERED ({columnname})                                                                   |
| Limit Syntax                            | TOP {limit}                                                                                            |
| Limit Position                          | Front                                                                                                  |
| Current Timestamp Query                 | SELECT CURRENT_TIMESTAMP                                                                               |
| Column Quote Character                  | "                                                                                                      |
| Supports Returning Auto-generated Keys? | True                                                                                                   |
| Fetch Key Query                         | <Blank>                                                                                                |
| Table List Filter                       | <Blank>                                                                                                |
| Data Type Mapping                       |                                                                                                        |
| Byte (I1)                               | int                                                                                                    |
| Short (I2)                              | int                                                                                                    |
| Integer (I4)                            | int                                                                                                    |
| Long (I8)                               | bigint                                                                                                 |
| Boolean                                 | int                                                                                                    |
| Datetime                                | datetime                                                                                               |
| Float (R4)                              | float(10)                                                                                              |
| Double (R8)                             | double precision                                                                                       |
| String                                  | varchar(255)                                                                                           |

|           |               |
|-----------|---------------|
| Binary    | varbinary     |
| Long Text | nvarchar(max) |

| Main Properties                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name                               | <Name of the driver, as you would like it to appear on the Gateway>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Description                        | <Enter a useful description you would like to see next to the driver>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Class Name                         | com.microsoft.sqlserver.jdbc.SQLServerDriver                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| JAR File(s)                        | <Click on the <b>Choose File</b> button to select and upload the JAR(s). This is the part where you upload the JDBC driver. >                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Driver Defaults & Instructions     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Driver Type                        | Microsoft SQL Server                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| URL Format                         | jdbc:sqlserver://localhost\SQLEXPRESS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| URL Instructions                   | <p>&lt;br/&gt;The format of the SQL Server connect URL is:&lt;br/&gt;&lt;code&gt;jdbc:sqlserver://&lt;b&gt;host&lt;/b&gt;\&lt;b&gt;instanceName&lt;/b&gt;[:&lt;b&gt;port&lt;/b&gt;]&lt;/code&gt;&lt;br/&gt;With the three parameters (in bold) &lt;ul style="list-style-type:none; margin-left:10px;"&gt;&lt;li&gt;&lt;b&gt;host&lt;/b&gt;: The host name or IP address of the database server.&lt;/li&gt;&lt;li&gt;&lt;b&gt;instanceName&lt;/b&gt;: (optional) the instance to connect to on the host. If not specified, a connection to the default instance is made.&lt;/li&gt;&lt;li&gt;&lt;b&gt;port&lt;/b&gt;: (optional) the port to connect to. The default is &lt;b&gt;1433&lt;/b&gt;. If you are using the default, you can omit the port and the preceding '&lt;/li&gt;&lt;/ul&gt;&lt;br/&gt;For SQL Server, you specify the &lt;i&gt;database name&lt;/i&gt; to connect to using the &lt;code&gt;databaseName&lt;/code&gt; property in the &lt;i&gt;Extra Connection Properties&lt;/i&gt;.</p> |
| Default Connection Properties      | databaseName=test                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Connection Properties Instructions | Use <i>databaseName=YOUR_DATABASE</i> to specify the database to connect to.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Default Validation Query           | SELECT 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| SQL Language Compatibility         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Default Translator                 | The Translator this driver should use. If you're adding a new Driver, then you may                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## Oracle Express Translator and JDBC Driver Settings

In some cases, you may need to add your own JDBC Driver, or configure a Translator. However, you may need to check the JDBC driver's documentation for information on how to configure them. Below are some recommended settings, but the vendor's documentation should always supersede any suggestions here.

| Main Properties                         |                                                                                                                                                                            |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name                                    | <Name of the Translator. The JDBC driver will reference the settings below by the name specified here>                                                                     |
| Create Table Syntax                     | CREATE TABLE {tablename} ({creationdef}{primarykeydef})                                                                                                                    |
| Create Sequence Syntax                  | CREATE SEQUENCE {tablename}seq START WITH 1 INCREMENT BY 1                                                                                                                 |
| Create Trigger Syntax                   | CREATE TRIGGER {tablename}trig BEFORE INSERT ON {tablename} REFERENCING NEW AS NEW FOR EACH ROW BEGIN select {tablename}seq.nextval INTO :NEW.{columnname} FROM dual; END; |
| Create Index Syntax                     | CREATE INDEX {indexname} ON {tablename}({columnname})                                                                                                                      |
| Auto Increment Field Definition         | {type} NOT NULL                                                                                                                                                            |
| Alter Table Syntax                      | ALTER TABLE {tablename} ADD ({alterdef})                                                                                                                                   |
| Add Column Syntax                       | {columnname} {type}                                                                                                                                                        |
| Primary Key Syntax                      | PRIMARY KEY ({columnname})                                                                                                                                                 |
| Limit Syntax                            | rownum<={limit}                                                                                                                                                            |
| Limit Position                          | Where                                                                                                                                                                      |
| Current Timestamp Query                 | SELECT CURRENT_TIMESTAMP FROM DUAL                                                                                                                                         |
| Column Quote Character                  | "                                                                                                                                                                          |
| Supports Returning Auto-generated Keys? | False                                                                                                                                                                      |
| Fetch Key Query                         | SELECT {tablename}SEQ.CURRVAL FROM DUAL                                                                                                                                    |
| Table List Filter                       | <leave empty>                                                                                                                                                              |
| Data Type Mapping                       |                                                                                                                                                                            |
| Byte (I1)                               | int                                                                                                                                                                        |
| Short (I2)                              | int                                                                                                                                                                        |
| Integer (I4)                            | int                                                                                                                                                                        |
| Long (I8)                               | int                                                                                                                                                                        |
| Boolean                                 | int                                                                                                                                                                        |
| Datetime                                | timestamp                                                                                                                                                                  |
| Float (R4)                              | float                                                                                                                                                                      |
| Double (R8)                             | double precision                                                                                                                                                           |
| String                                  | varchar2(255)                                                                                                                                                              |
| Binary                                  | varbinary                                                                                                                                                                  |
| Long Text                               | nclob                                                                                                                                                                      |

| Main Properties |                                                                       |
|-----------------|-----------------------------------------------------------------------|
| Name            | <Name of the driver, as you would like it to appear on the Gateway>   |
| Descrip         | <Enter a useful description you would like to see next to the driver> |

|                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| tion                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Classn ame                                | oracle.jdbc.driver.OracleDriver                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| JAR File(s)                               | <Click on the <b>Choose File</b> button to select and upload the JAR(s). This is the part where you upload the JDBC driver. >                                                                                                                                                                                                                                                                                                                                                            |
| <b>Driver Defaults &amp; Instructions</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Driver Type                               | Oracle                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| URL Format                                | jdbc:oracle:thin:@localhost:1521:test                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| URL Instructions                          | <br/>The format of the Oracle connect URL is:<br/><code>jdbc:oracle:thin:@<b>host</b>:<b>port</b>:<b>SID</b></code><br/>With the three parameters (in bold) <ul style="list-style-type:none; margin-left:10px;"><li><b>host</b>: The host name or IP address of the database server.</li><li><b>port</b>: The port that the database server is running on. Oracle's default port is <b>1521</b>.</li><li><b>SID</b>: the system ID that identifies the database to connect to.</li></ul> |
| Default Connection Properties             | <Blank>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Connection Properties Instructions        | <Blank>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Default Validation Query                  | SELECT 1 FROM DUAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>SQL Language Compatibility</b>         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Default Translator                        | The Translator this driver should use. If you're adding a new Driver, then you may                                                                                                                                                                                                                                                                                                                                                                                                       |

## PostgreSQL Translator and JDBC Driver Settings

In some cases, you may need to add your own JDBC Driver, or configure a Translator. However, you may need to check the JDBC driver's documentation for information on how to configure them. Below are some recommended settings, but the vendor's documentation should always supersede any suggestions here:

| Main Properties                 |                                                                                                        |
|---------------------------------|--------------------------------------------------------------------------------------------------------|
| Name                            | <Name of the Translator. The JDBC driver will reference the settings below by the name specified here> |
| Create Table Syntax             | CREATE TABLE {tablename} ({creationdef}{primarykeydef})                                                |
| Create Sequence Syntax          | <Blank>                                                                                                |
| Create Trigger Syntax           | <Blank>                                                                                                |
| Create Index Syntax             | CREATE INDEX {indexname} ON {tablename}({columnname})                                                  |
| Auto Increment Field Definition | SERIAL NOT NULL                                                                                        |
| Alter Table Syntax              | ALTER TABLE {tablename} {alterdef}                                                                     |
| Add Column Syntax               | ADD COLUMN {columnname} {type}                                                                         |
| Primary Key Syntax              | PRIMARY KEY ({columnname})                                                                             |
| Limit Syntax                    | LIMIT {limit}                                                                                          |

|                                         |                          |
|-----------------------------------------|--------------------------|
| Limit Position                          | Back                     |
| Current Timestamp Query                 | SELECT CURRENT_TIMESTAMP |
| Column Quote Character                  | "                        |
| Supports Returning Auto-generated Keys? | True                     |
| Fetch Key Query                         | <Blank>                  |
| Table List Filter                       | <Blank>                  |

#### Data Type Mapping

|              |                  |
|--------------|------------------|
| Byte (I1)    | int              |
| Short (I2)   | int              |
| Integer (I4) | int              |
| Long (I8)    | bigint           |
| Boolean      | int              |
| Datetime     | timestamp        |
| Float (R4)   | float            |
| Double (R8)  | double precision |
| String       | varchar(255)     |
| Binary       | bytea            |
| Long Text    | text             |

| Main Properties                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name                               | <Name of the driver, as you would like it to appear on the Gateway>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Description                        | <Enter a useful description you would like to see next to the driver>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Classname                          | org.postgresql.Driver                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| JAR File(s)                        | <Click on the <b>Choose File</b> button to select and upload the JAR(s). This is the part where you upload the JDBC driver. >                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Driver Defaults & Instructions     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Driver Type                        | PostgreSQL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| URL Format                         | jdbc:postgresql://localhost:5432/test                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| URL Instructions                   | <p>&lt;br/&gt;The format of the PostgreSQL connect URL is:&lt;br/&gt;&lt;code&gt;jdbc:postgresql://&lt;b&gt;host&lt;/b&gt;:&lt;b&gt;port&lt;/b&gt;/&lt;b&gt;database&lt;/b&gt;&lt;/code&gt;&lt;br/&gt;With the three parameters (in bold) &lt;ul style="list-style-type:none; margin-left:10px;"&gt;&lt;li&gt;&lt;b&gt;host&lt;/b&gt;: The host name or IP address of the database server.&lt;/li&gt;&lt;li&gt;&lt;b&gt;port&lt;/b&gt;: The port that the database server is running on. PostgreSQL default port is &lt;b&gt;5432&lt;/b&gt;.&lt;/li&gt;&lt;li&gt;&lt;b&gt;database&lt;/b&gt;: The name of the logical database that you are connecting to on the PostgreSQL server.&lt;/li&gt;&lt;/ul&gt;</p> |
| Default Connection Properties      | <Blank>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Connection Properties Instructions | No extra connection parameters are recommended for PostgreSQL. For possible parameter values, see the documentation at <a href='the'> <a href="http://jdbc.postgresql.org">http://jdbc.postgresql.org</a> '>the PostgreSQL JDBC driver website</a>.                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

|                                   |                                                                                    |
|-----------------------------------|------------------------------------------------------------------------------------|
| Default Validation Query          | SELECT 1                                                                           |
| <b>SQL Language Compatibility</b> |                                                                                    |
| Default Translator                | The Translator this driver should use. If you're adding a new Driver, then you may |

## Add a New JDBC Driver

To add a new JDBC driver to Ignition, do the following steps:

1. On the Gateway Webpage Config section, click on **Databases > Drivers**.



The Database Drivers & Settings page is displayed.

2. Click on the **Create new JDBC Driver...** link at the bottom of the page.

| Name                | Driver Type          | Default Translator | Status    | Actions                                       |
|---------------------|----------------------|--------------------|-----------|-----------------------------------------------|
| MariaDB             | MySQL                | MYSQL              | Installed | <button>delete</button> <button>edit</button> |
| Microsoft SQLServer | Microsoft SQL Server | MSSQL              | Installed | <button>delete</button> <button>edit</button> |
| MySQL               | MySQL                | MYSQL              | Installed | <button>delete</button> <button>edit</button> |
| Oracle JDBC         | Oracle               | ORACLE             | Installed | <button>delete</button> <button>edit</button> |
| PostgreSQL          | PostgreSQL           | POSTGRES           | Installed | <button>delete</button> <button>edit</button> |
| SQLite              | Generic              | SQlite             | Installed | <button>delete</button> <button>edit</button> |

[Create new JDBC Driver...](#)

Note: Please see [this help page](#) for information about installing driver files that are not able to be bundled with Ignition.

3. In the **Name** field, type the full name of the JDBC driver, see the manufacturer's documentation to get the name.
4. In the **JAR File(s)** field, specify the JAR file that contains the driver, as well as any other required JARs. If you do not have the JAR file needed, see above for download links.
5. Use the default settings for the following properties:

| Driver Defaults and Instructions |                                                                                                                                                                                                                                                            |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Driver Type                      | Is the brand of database. This is used for optimizations in the Gateway, if in doubt, select GENERIC.                                                                                                                                                      |
| URL Format                       | Is a default value for the connect URL. This provides a hint to the format of the connect URL that this driver requires while adding a datasource connection. For example, the hint for the format can be, <code>jdbc:dbtype://host:port/database</code> . |
| URL Instructions                 | Free form instructions that are shown to help the user to create a connection.                                                                                                                                                                             |

|                                    |                                                                                   |
|------------------------------------|-----------------------------------------------------------------------------------|
| Default Connection Properties      | Any additional properties to add by default to the connection string.             |
| Connection Properties Instructions | Tips about which connection properties might be useful.                           |
| Default Validation Query           | The default query that is used to verify that the connection is available.        |
| <b>SQL Language Compatibility</b>  |                                                                                   |
| Default Translator                 | The database translator that is used by default for connections from this driver. |

6. Click the **Create New JDBC Driver** button, located at the very bottom of the page, to create the new driver.

## Upgrade a JDBC Driver

In some cases you may need to upgrade a driver. The steps below detail where this would take place

1. You will need to obtain the new driver. These are typically provided by the same organization that made the database. The driver will be a JAR file.
2. Once you have the new driver, head to your Ignition Gateway's **Config** section, click on **Databases > Drivers**.
3. The Database Drivers & Settings page will be displayed. These are the currently configured JDBC drivers on the Gateway, and can be modified from the **Edit** button. Click the Edit button for the driver you need to upgrade.
4. You will need to pass in the new driver to the **JAR File(s)** property.
  - a. Click the **Choose File** button
  - b. Navigate to the driver, and click **Open**.
5. **[Optional]** Update any other properties. In most cases, you may skip this step. However you may need to update some other properties when a new driver is in place. This step depends on the driver, and what it changes. Refer to the driver's documentation to determine if any connection properties need to be changed. For example, users upgrading to MySQL 8.0 from legacy versions will need to change the Default Connection Properties value from:

```
zeroDateTimeBehavior=convertToNull;
```

to:

```
zeroDateTimeBehavior=CONVERT_TO_NULL;useSSL=false;allowPublicKeyRetrieval=true;
```

Again, this step depends on the driver, and in some cases you may be able to skip it.

6. Click the **Save Changes** button at the bottom of the page.

## Database Translators

Despite the presence of a SQL standard, many database system vary in how they implement or accomplish various tasks. The JDBC driver system tries to hide these differences as much as possible, but unfortunately some differences persist.

The database translator system in Ignition navigates these differences as they apply to the system. It provides a way to define certain key operations that are commonly different between database vendors, such as creating auto-incrementing index columns, and the keywords used for different data types.

### Translator Management

Database translators are managed in the Gateway from the **Databases > Drivers > Translators** tab. Ignition comes pre-configured with translators for the major supported databases, but you can edit and remove them, as well as create new translators. It is necessary to create a new translator only when adding a new JDBC driver for a database that does not share syntax with any of the existing translators.

### Creating a New Translator

To add a new database translator to Ignition, do the following steps:

- In the Gateway Config section, click on **Databases > Drivers**.  
The Database Drivers & Settings page is displayed.
- Go to the Translators tab, find the blue arrow, and click on the **Create new Database Translator...** link.  
The New Database Translator page is displayed showing a list of all the translator properties.
- Define the tokens used with the translator properties on the New Database Translator page.

For most of the properties, you need to define special token markers to indicate places where other values are placed. For example, the default **Create Table Syntax** entry looks as follows:

```
CREATE TABLE {tablename} ({creationdef}{primarykeydef})
```

Where:

`tablename`, `creationdef`, and `primarykeydef` are all tokens that are expanded. `tablename` is replaced directly with the table, `creationdef` is a list of columns, and `primarykeydef` is the phrase created by the **Primary Key Syntax** entry in the translator.

The possible tokens are as follows:

| Token                                                                  | Description                                                                                                                                                                                   |
|------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>tablename</code>                                                 | The name of the table being created.                                                                                                                                                          |
| <code>indexname</code>                                                 | The name of the index to create, when adding a column index to the table.                                                                                                                     |
| <code>primarykeydef</code>                                             | A clause that defines a primary key for a new table.                                                                                                                                          |
| <code>creationdef</code>                                               | The list of columns to create in the table.                                                                                                                                                   |
| <code>alterdef</code>                                                  | A list of columns to add/remove/modify in the table.                                                                                                                                          |
| <code>columnname</code>                                                | The name of a column.                                                                                                                                                                         |
| <code>type</code>                                                      | The data type of a column.                                                                                                                                                                    |
| <code>limit</code>                                                     | The value of the limit clause.                                                                                                                                                                |
| <b>Other Properties</b>                                                |                                                                                                                                                                                               |
| <code>Limit Position</code>                                            | Defines where the limit clause should be placed. <b>Back</b> , the limit is placed at the end of the query. <b>Front</b> , places it directly after the SELECT keyword.                       |
| <code>Column Quote Character</code>                                    | All columns are created and accessed with the defined quote, which tells the database to use a specific casing, as well as avoiding collisions between the column name and database keywords. |
| <code>Supports Returning Auto-generated Keys? / Fetch Key Query</code> | Indicates whether the JDBC driver supports the return of generated keys. If the driver does not support this feature, the <b>Fetch Key Query</b> is used to retrieve the last key.            |
| <b>Date Type Mapping</b>                                               |                                                                                                                                                                                               |
| <code>All data types</code>                                            | The keywords that are used when creating columns of the given types.                                                                                                                          |

- Click the **Create New Database Translator** button, located at the very bottom of the page, to create the translator.

# Store and Forward

The store-and-forward system provides a reliable way for Ignition to store data to the database. In Ignition, systems such as [Tag Historian](#) and [SQL Bridge \(Transaction Groups\)](#) use store-and-forward to ensure that data reaches its destination in the database, and is stored in an efficient manner. The store-and-forward system can be configured in a number of ways, offering both memory buffering for performance and local disk caching for safe storage.

**Note:** Store-and-forward engines are automatically created for each Database Connection.

## Primary Features and Benefits

The store-and-forward system offers a number of benefits over other systems that log directly to the database, such as:

- **Data loss prevention**  
Data is removed from the system only when the write to the database has executed successfully.
- **Guaranteed ordering**  
Data is forwarded in the same order that it arrived, even if a database connection is not currently available.
- **Enhanced performance**  
By first buffering the data in memory, the store-and-forward system can optimize writes, and prevent the originating systems from blocking. This means that the system is less likely to lose data samples in the event of system slow downs.

## On this page ...

- [Primary Features and Benefits](#)
- [Store and Forward Data Flow](#)
  - [Understanding the Forward Triggers](#)
  - [Store and Forward for Reliability](#)



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## Using Store and Forward

[Watch the Video](#)

## Store and Forward Data Flow

Although the system offers settings that can affect the pipeline, by default the data flow occurs as follows:

1. Data is generated in some system.
2. Data is placed in a memory buffer.
3. If not removed from memory buffer in some time (the **Write Time**), or if a certain amount of data accumulates (**Write Size**), it is placed in the local cache.
4. The data sink, based on a database connection, pulls data in first from the local store, and then the memory buffer, based on the **Write Time** and **Write Size** settings under **Forward Settings**.
5. If the data fails to forward, either due to an error in the connection or in the data itself, it is returned to the buffer or cache.
6. If the data errors out too many times, it becomes quarantined.
7. Quarantined data can be managed through the Gateway, and can be deleted or un-quarantined, once the error is resolved.

## Understanding the Forward Triggers

Data is forwarded from one stage to the next based on the **Write Time** and **Write Size** triggers. These settings work as an **either/or** manner, meaning that if either of them is surpassed, the data is forwarded. One important point to note is that the **Write Size** setting influences the transaction size of similar data to be forwarded, and therefore can have a big impact on performance. As a result, the **Write Time** should normally be used as the controlling factor, with the **Write Size** set to something that will provide reasonable transactions, like 100.

## Store and Forward for Reliability

The store-and-forward system settings, while seemingly limited, offer a good deal of flexibility in tuning. Different types of situations and goals will likely require different configurations.

When the safety of the data is a concern, the goal is to get the data stored to disk as quickly as possible in order to minimize risk of loss due to a power outage or system failure. The local cache plays a crucial role in this, allowing the system to store data locally for any amount of time until the remote database can accept it. This protects against network failures and database failures, as well.

By setting the **write size** and **write time** of both the local cache and forwarder to low values, the data spends less time in the memory buffer. While the memory buffer can be set to 0 to bypass it completely, this is not usually recommended, as the buffer is used to create a loose coupling between the history system and other parts of Ignition that report history. This disconnect improves performance and protects against temporary system slowdowns. In fact, it is recommended that for reliable logging, this value be set to a high value, to allow the maximum possible amount of data to enter the system in the case of a storage slowdown.

In This Section ...

# Using Store and Forward

The current status of the Store and Forward system can be viewed from the Status section of the [Gateway Web Interface](#). These pages provide detailed analysis on each Store and Forward engine.

## To Monitor the Store and Forward Engine

1. Go to the **Status** section of the Gateway.
2. Click on **Store & Forward** from the left menus.  
The **Store & Forward Connections** page is displayed showing each store-and-forward engine along with the current throughput and capacity of its **Memory Buffer** and **Disk Cache**.

On this page, there are several notable items:

| Name                 | Description                                                                                                                                                                                                                                   |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Aggregate Throughput | The aggregated number of records inserted into a database from any engine, per second.                                                                                                                                                        |
| Total Quarantined    | The current count of quarantined items across all engines.                                                                                                                                                                                    |
| Total Dropped        | The number of records that have been dropped from all store and forward engines. A record is considered dropped if it can not be added to one of the buffers, such as when a buffer is full, and the engine can no longer accept new records. |

## On this page ...

- [To Monitor the Store and Forward Engine](#)



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## Using Store and Forward

[Watch the Video](#)

My-Gateway

Ignition!

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Help ? Get Designer

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**DIAGNOSTICS**

- Execution
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Status > Connections > **Store and Forward**

Configuration

Aggregate Throughput per second: 0.5

Total Quarantined: 0

Total Dropped: 0

### Store and Forward Engines

Filter type to filter View 20

| Name                 | Store Throughput | Forward Throughput | Quarantined | Activity    | Actions |
|----------------------|------------------|--------------------|-------------|-------------|---------|
| DB                   | 0.5/sec          | 0.5/sec            | 0           | ✓ Available | Details |
| Local Edge Historian | N/A              | N/A                | 0           | ✓ Available | Details |
| SQLite               | N/A              | N/A                | 0           | ✓ Available | Details |

You can click on **Details** under the **Store and Forward Engines** section to refresh and update the displayed values. This page provides in-depth information on the current status of the engine.

| Name              | Description                                                                                                                                                                                                                                                                                                                                                        |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Memory Buffer     | The number of records entering the Memory Buffer per second. The progress bar shows the percent of the buffer being utilized, along with the current and max number of records.                                                                                                                                                                                    |
| Disk Buffer       | The number of records entering the Disk Buffer per second. Note that a state of "idle" means the engine is able to successfully store all records into the database before the <b>Write Size</b> or <b>Write Time</b> values have been reached. The progress bar shows the percent of the buffer being utilized, along with the current and max number of records. |
| Database          | Shows the number of records pushed from either buffer to the database per second.                                                                                                                                                                                                                                                                                  |
| Quarantined Items | Lists all quarantined items in the engine. Includes the number of occurrences, a description of the where the items originated from, and the reason why the record was placed into the quarantine. Provides an opportunity to retry, export, or delete the items.                                                                                                  |

My-Gateway

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Ignition!

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Status

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Help ?

Get Designer

Configuration

Store Details

Memory Buffer /sec 0 0% (0/250)

Local Cache Idle 0% (0/25000)

Database Storage /sec 0

Quarantined Items

Import quarantine file < Retry All

Delete All

The screenshot shows the Ignition My-Gateway web interface. The left sidebar is dark blue and contains several navigation items: Home, Status, Config, SYSTEMS (with sub-options like Overview, Performance, etc.), CONNECTIONS (with sub-options like EAM Agents, Databases, etc.), and a highlighted item, Store & Forward, which is enclosed in a red box. The main content area is titled 'Store and Forward' and displays 'Store Details' for three storage types: Memory Buffer, Local Cache, and Database Storage. Each detail card includes a value (0), a unit (/sec or Idle), and a progress bar indicating 0% completion against a limit (250 or 25000). Below these cards is a 'Quarantined Items' section with buttons for 'Import quarantine file', 'Retry All', and 'Delete All'.

Related Topics ...

- [Configuring Store and Forward](#)

# Configuring Store and Forward

## Store and Forward for High-speed Buffering

When configuring the store-and-forward system for high-speed buffering, you are expecting the case that data will come in quick bursts. By buffering the data, the system can accommodate more information than would be possible going directly against the database.

The key points in configuring a buffering system is to avoid expensive operations like storing and reading from the local cache, and to set the memory buffer large enough to accommodate the expected burst sizes.

Each database connection has its own store and forward settings. Store-and-forward engines are directly correlated to database connections, and are automatically managed so that each connection has an engine defined.



You can create multiple database connections pointing to the same database if you wish to configure multiple store-and-forward engines for different purposes.

## Configuring Store and Forward

To configure the Store and Forward engine for your database, do the following steps:

1. Go to the Gateway **Config** section and select **Databases > Store and Forward**.  
The **Store and Forward** page is displayed and you will see a store-and-forward setting for each of your database connections and you can edit these settings.
2. On the **Store and Forward** page, look for **edit** at the far right of the table and click on it to see all the store-and-forward settings.  
The settings of a store-and-forward engine define how and when data is moved through the system. You must understand these settings so that you can carefully set them according to your goals.

The screenshot shows the Ignition My-Gateway configuration interface. The left sidebar has sections for Home, Status, and Config (which is selected). Under Config, there are sections for SYSTEM (Overview, Backup/Restore, Ignition Exchange, Licensing, Modules, Projects, Redundancy, Gateway Settings) and NETWORKING (Web Server, Gateway Network, Email Settings). The main content area is titled "Config > Database > Store and Forward Settings". It displays a table with three rows:

| Name     | Memory Buffer Size | Disk Cache Enabled | Action                                            |
|----------|--------------------|--------------------|---------------------------------------------------|
| DB       | 250                | true               | <a href="#">edit</a> (highlighted with a red box) |
| SQLite   | 250                | true               | <a href="#">edit</a>                              |
| Internal | 250                | true               | <a href="#">edit</a>                              |

A note at the bottom of the table area states: "Note: Store and Forward engines are automatically created for each Database Connection. For details about a store's status, see the [Store and Forward Status](#) page."

## On this page ...

- [Store and Forward for High-speed Buffering](#)
  - [Configuring Store and Forward](#)
  - [Store and Forward Settings](#)



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## Configuring Store and Forward

[Watch the Video](#)

| <b>Buffer Settings</b>                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Memory Buffer Size                                                                                                                                                                                                                     | The number of records that can be stored in the memory buffer, the first stage of the store-and-forward chain. Other settings define when the data will move from the memory buffer forward, this setting only determines the maximum size. If the max size is reached, additional data will error out and be discarded. The memory buffer cannot quarantine data, so if there are errors and the disk cache is not enabled, the data will be lost.<br><br>If set to 0, the memory buffer will always be considered full, dropping records.   |
| <b>Store Settings</b>                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>These settings apply to the local disk storage cache.</b>                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Disk Cache Enabled                                                                                                                                                                                                                     | Turns on the hard-disk cache. Data is stored here if it cannot be forwarded in a timely manner. The cache also stores quarantined data (that is, data with errors).                                                                                                                                                                                                                                                                                                                                                                           |
| Max Records                                                                                                                                                                                                                            | The maximum size of the cache. After the max is reached, data is backed up into the memory buffer, and once that is full, it is dropped. A 'record' is an insert or update statement. These statements may be batches, thus it is possible for a single 'record' to impact multiple rows.                                                                                                                                                                                                                                                     |
| Write Size                                                                                                                                                                                                                             | The number of records that should be accumulated in the memory store before written to the cache. Writing data in blocks can increase performance, but too large of a size increases the risk of data being lost in the event of a power outage or system failure.                                                                                                                                                                                                                                                                            |
| Write Time                                                                                                                                                                                                                             | The max age of records in the memory buffer before they are stored to the cache. This setting is used in combination with the write size in order to give the forwarder the opportunity to retrieve data directly from the memory store and avoid the write to disk entirely.                                                                                                                                                                                                                                                                 |
| <b>Forward Settings</b>                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>These settings govern when data is forwarded to the database. The data is pulled first from the local cache, and then from the memory store. When no data is present in the cache, it is pulled directly from the memory store.</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Write Size                                                                                                                                                                                                                             | Same as disk cache setting above.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Write Time                                                                                                                                                                                                                             | Same as disk cache setting above.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Enable Schedule                                                                                                                                                                                                                        | If enable schedule is selected, the forward engine will only be enabled during the times specified by the pattern. The pattern can specify specific times and ranges using a simple syntax.                                                                                                                                                                                                                                                                                                                                                   |
| Schedule Pattern                                                                                                                                                                                                                       | <p>The schedule is specified as a comma separated list of times or time ranges. You can use the following formats:</p> <p>24-hour times, that is <b>8:00-15:00</b> (for 8am through 3pm) or <b>21:00-24:00</b> (9pm through midnight).</p> <p>12-hour with am/pm (if not specified, <b>12</b> is considered noon): <b>8am-3pm or 9pm-12am</b></p> <p><b>Note:</b> When the time period is over, any queued data will remain cached until the next execution period. That is, the forward engine does not run until all data is forwarded.</p> |

Once you made the changes you want, click **Save Changes** at the bottom of the page. This will take you back to the Store and Forward page.

#### Related Topics ...

- [Controlling Quarantine Data](#)

# Controlling Quarantine Data

Quarantined data is data that has erred-out multiple times during attempts to forward it or data that could not be stored because of some configuration issues. It is removed from the forward queue to allow other data to pass. The most common reason for data quarantining is an invalid schema in the database for the data that is being stored. Quarantined data is held indefinitely until the issue is resolved, then you can either delete it or re-insert it into the queue.

## Handle the Quarantined Data

1. From **Status** section of the Gateway, go to **Connections > Store and Forward**.
2. Click the **Details** tab next to a Store and Forward engine that you would like to see the quarantine data for. Here you will see any quarantined data, including the number of occurrences, a description of the where the items originated from, and the reason why the record was placed into the quarantine. Each set of data has the option to retry it, delete it, or export it for later use. If there are a lot of quarantined records, it may be a good idea to export and delete them so that the store and forward engine won't fill up and drop records.
3. Fix the problem/error you found that caused the quarantine data.
4. Click on **retry**, or if the data had been exported, import the data using the import tool and then **retry**. This way, you can ensure no data gets lost.

## On this page ...

- [Handle the Quarantined Data](#)



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## Controlling Quarantine Data

[Watch the Video](#)

» Status > Connections > **Store and Forward**

[Configuration](#)

### Store Details

| Memory Buffer | Local Cache  | Database Storage |
|---------------|--------------|------------------|
| 6 /sec        | 1 /sec       | 6 /sec           |
| 1% (2/250)    | 0% (0/25000) |                  |

### Quarantined Items

[Import quarantine file](#)

[Choose File](#) No file chosen

[Submit](#)

[Retry All](#) [Delete All](#)

[Filter](#)  [View](#) 20

| ID | Count | Description         | Reason                                                | Actions                                                             |
|----|-------|---------------------|-------------------------------------------------------|---------------------------------------------------------------------|
| 1  | 10    | SQLTag History Data | Duplicate entry '252-1548372275630' for key 'PRIMARY' | <a href="#">Retry</a> <a href="#">Delete</a> <a href="#">Export</a> |

#### Related Topics ...

- [Store and Forward](#)
- [Connections - Store & Forward](#)

# Security

Security options in Ignition provide many ways to safeguard access to your data and applications. You control not only who accesses your systems, but when and where they can access them. Ignition offers two authentications strategies: [Classic Authentication Strategy](#) or [Identity Provider Authentication Strategy](#).

## Gateway Security

Security in Ignition falls into a few categories, tying into the various scopes (Designer, Gateway, Vision Clients and Perspective Sessions). In the Gateway scope, the bulk of security setup happens under the **Config** section of the Gateway Webpage, under the Security header. you'll find pages for authentication, role mappings, zones, and more.



## On this page ...

- [Gateway Security](#)
- [Authentication Strategies](#)
  - [Classic Authentication Strategy \(Designer and Vision Only\)](#)
  - [Identity Provider Authentication Strategy](#)

The primary purpose of Gateway security is to protect access to the two most critical areas of Ignition: the Designer and the Gateway. Many important resources are configured in these areas, so access to each Gateway section (Status and Config), as well as the Designer, can be limited by Security Level.

## Authentication Strategies

In regard to authentication and permissions, there are two approaches.

### Classic Authentication Strategy (Designer and Vision Only)

[Classic Authentication Strategy](#) involves a concept known as a User Source, which is a configuration that contains multiple roles and users. Users are assigned roles, and security restrictions within a project can be used to check if a user has one or more roles. User Sources can be "internal", meaning all users and roles are contained within an Ignition Gateway, or externally stored in an SQL database. Furthermore, User Sources offer integration with [Active Directory](#).

### Identity Provider Authentication Strategy

Ignition can also integrate with Federated [Identity Providers](#) (IdP), allowing users to authenticate against a trusted third party. The Identity Provider Authentication Strategy works by assigning [Security Level](#) restrictions to various features within Ignition, and utilizing [User Attribute Mapping](#) and [Security Level Rules](#) to assign Security Levels to users.

Ignition can integrate with both OpenID Connect and Security Assertion Markup Language (SAML) providers. In addition, Ignition can act as an Identity Provider for isolated systems.

# Gateway General Security Settings

This feature is new in Ignition version **8.1**  
[Click here](#) to check out the other new features

The Gateway General Security Settings page is new for release 8.1. This page determines security permissions for the Gateway and Designer.

Config > Security > General

**General Gateway Security Settings** \* Required Field

|                                    |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| System Identity Provider *         | default       | This Identity Provider controls access to the Gateway's web configuration interface and the Designer when the Designer Authentication Strategy is set to Identity Provider.<br><input checked="" type="checkbox"/> Always ask the IdP to re-authenticate users by default<br>When enabled, Ignition will always ask the IdP to re-authenticate the user by default. This effectively disables Single Sign-On.                                            |
| Designer Authentication Strategy * | Classic       | Controls how Designer users are authenticated. The Classic strategy requires the user to enter their username and password in an embedded login form in the Designer. Classic authentication is performed against the System User Source. The Identity Provider strategy redirects the user to their IdP in their web browser in order to authenticate. The System Identity Provider setting controls which Identity Provider the user is redirected to. |
| System User Source *               | default       | This user source controls access to the Designer when the Designer Authentication Strategy is set to Classic.                                                                                                                                                                                                                                                                                                                                            |
| Designer Role(s) *                 | Administrator | Users must belong to one of these roles in order to log into the Designer. Multiple roles can be specified by separating them with commas. Example: Administrator, Operator                                                                                                                                                                                                                                                                              |
| Create Project Role(s)             |               | Users must belong to one of these roles in order to create a new Designer project. Multiple roles                                                                                                                                                                                                                                                                                                                                                        |

## On this page ...

- [Gateway Security Settings Table](#)



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## Restricting Gateway Access

[Watch the Video](#)

## Gateway Security Settings Table

| Setting                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| System User Source               | This user source controls access to the Designer when the Designer Authentication Strategy is set to Classic. This field is required.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| System Identity Provider         | Dropdown list to select the Identity Provider that controls access to the Gateway's web configuration interface and the Designer (only when the Designer Authentication Strategy is set to <b>Identity Provider</b> ).<br><br>Additional option to always ask the IdP to re-authenticate users by default. When enabled, Ignition will always ask the IdP to re-authenticate the user by default. This effectively disables Single Sign-On.<br><br>This field is required.                                                                                                                                                                                                                                                                                                      |
| Designer Authentication Strategy | Controls how the Designer authenticates users. Options are <b>Classic</b> or <b>Identity Provider</b> . <ul style="list-style-type: none"><li><b>Classic:</b> The Classic strategy requires the user to enter their username and password in an embedded login form in the Designer. Classic authentication is performed against the System User Source.</li><li><b>Identity Provider:</b> The Identity Provider strategy redirects the user to their IdP in their web browser in order to authenticate. The System Identity Provider setting controls which Identity Provider the user is redirected to. Required.</li></ul><br>This field is required. Additional options on this screen will change depending on the Designer Authentication Strategy that is selected here. |
| Designer Permissions             | ( <i>Identity Provider strategy only</i> ) Select one of the following options: <ul style="list-style-type: none"><li>Users must belong to all of these security levels in order to login to the Designer.</li><li>Users must belong to at least one of these security levels in order to login to the Designer.</li></ul><br><div style="border: 1px solid red; padding: 5px;"><b>Caution:</b> Empty value in this field means "Public" security level: Access will be unrestricted.</div>                                                                                                                                                                                                                                                                                     |
| Create Project Permissions       | ( <i>Identity Provider strategy only</i> ) Enter the security levels required to create a new project, for example, Authenticated/Roles /Administrator, SecurityZones/localhost.. Then select one of the following options:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                            | <ul style="list-style-type: none"> <li>• Users must belong to all of these security levels in order to create a new Designer project.</li> <li>• Users must belong to at least one of these security levels in order to create a new Designer project.</li> </ul> <p><b>Caution:</b> Empty value in this field means "Public" security level: Access will be unrestricted.</p>                                                                                                                                                                                                                                                                                                       |
| Designer Role(s)           | (Classic authentication strategy only) Enter the roles required for access to the Designer. Users must belong to at least one of these roles in order to log into the Designer. Multiple roles can be specified by separating them with commas, for example: Administrator, Operator.                                                                                                                                                                                                                                                                                                                                                                                                |
| Create Project Role(s)     | (Classic authentication strategy only) Enter the roles required for create a new Designer project. Users must belong to at least one of these roles in order to create a new Designer project. Multiple roles can be specified by separating them with commas, for example: Administrator, Operator.                                                                                                                                                                                                                                                                                                                                                                                 |
| Gateway Config Permissions | <p>Enter the security levels required for access to the Gateway Config section. Then select one of the following options:</p> <ul style="list-style-type: none"> <li>• Users must belong to all of these security levels in order to login to the configuration section.</li> <li>• Users must belong to at least one of these security levels in order to login to the configuration section.</li> </ul> <p>Multiple security level paths can be specified by separating them with commas. For example, Authenticated/Roles/Administrator, SecurityZones/localhost</p> <p><b>Caution:</b> Empty value in this field means "Public" security level: Access will be unrestricted.</p> |
| Status Page Permissions    | <p>Enter the security levels required for access to the Gateway Status section. Then select one of the following options:</p> <ul style="list-style-type: none"> <li>• Users must belong to all of these security levels in order to login to the configuration section.</li> <li>• Users must belong to at least one of these security levels in order to login to the configuration section. Multiple security level paths can be specified by separating them with commas, for example: Authenticated/Roles/Administrator, SecurityZones /localhost.</li> </ul> <p><b>Caution:</b> Empty value in this field means "Public" security level: Access will be unrestricted.</p>      |
| Home Page Permissions      | <p>Sets the security levels required to access the Gateway Home section. Then select one of the following options:</p> <ul style="list-style-type: none"> <li>• Users must belong to all of these security levels in order to login to the home section.</li> <li>• Users must belong to at least one of these security levels in order to login to the home section. Multiple security level paths can be specified by separating them with commas, for example: Authenticated/Roles/Administrator, SecurityZones/localhost.</li> </ul> <p><b>Caution:</b> Empty value in this field means "Public" security level: Access will be unrestricted.</p>                                |
| User Inactivity Timeout    | <p>This feature is new in Ignition version <b>8.1.1</b><br/> <a href="#">Click here</a> to check out the other new features</p> <p>The number of minutes which must elapse before expiring a user's gateway web interface session to inactivity. Sessions will not timeout if set to any number less than or equal to zero.</p>                                                                                                                                                                                                                                                                                                                                                      |
| Allow User Admin           | Allows the administration of the gateway's system user source from the Designer and client. Unless this is enabled, the Vision module's 'User Management Component' will be prevented from altering the gateway's system user source and scripts will not be able to alter users or roles. (Default is false.)                                                                                                                                                                                                                                                                                                                                                                       |
| Allow Designer SSO         | Allows single-sign-on authentication for logging into the Designer if the System User Source supports it. The Designer SSO capability is only available when the Designer Authentication Strategy is set to Classic. (Default is false.)                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Gateway Audit Profile      | Dropdown list to select the The name of the audit profile that Gateway-scoped actions will log to.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

Related Topics ...

- [Users, Roles](#)
- [Service Security](#)

# Classic Authentication Strategy

The Classic authentication strategy authenticates users against a User Source. Both the Designer and Vision can authenticate users with this strategy.

## User Sources

User sources are a collection of users, roles, and other user data, such as contact information or schedule. When a [new user or role is created](#), it is applied and stored in the user source. Projects and the Gateway are assigned a User Source to authenticate against. This determines which users have access to which project(s).

There are several types of user sources: single-storage types with varying storage mediums, "hybrids" that combine features of the other types, and a cache type used in Local Client Fallback systems.

**Note:** If you have Ignition 8.1 with the Perspective module, authentication is handled instead by [Identity Provider Authentication Strategy](#).

## On this page ...

- [User Sources](#)
  - [Single-Storage](#)
  - [Hybrid](#)
  - [Fallback Cache](#)
- [Shared Functionality](#)
- [Main Properties](#)
- [The Default User Source](#)
  - [Editing a User](#)

## Single-Storage

Users and roles are stored in a single location. The single-storage users sources are:

- [Internal Authentication](#) - Users and roles are stored internally to Ignition.
- [Database Authentication](#) - Users and roles are stored in a SQL database. Managing users is done via direct interaction with the database.
- [Active Directory Authentication](#) - Users and roles are managed by Active Directory. Users are authenticated through the LDAP protocol.

## Hybrid

Users in hybrid user sources authenticate against Active Directory, meaning that user names and passwords are checked against those stored in Active Directory. However, roles are stored either internally in Ignition or in a SQL database, so it is possible to make a role change without have to contact your Active Directory administrator. This way, Active Directory can be consulted to see if a user is valid, but the management of roles does not require coordination with the IT department, who typically control the Active Directory system. This "best of both worlds" approach is popular for many users of Active Directory.

- [Active Directory-Internal Hybrid](#) - Users managed by Active Directory and roles stored to Ignition internally.
- [Active Directory-Database Hybrid](#) - Users managed by Active Directory and roles stored in an SQL database.

## Fallback Cache

This User Source was developed specifically for a system that is using Local Client Fallback, and allows you to cache the login credentials from a remote user source. This means your users can still log in with their normal username/password on a Local Client Fallback project, even when the network connection is unavailable.

More information can be found on the [Fallback Cache Authentication](#) page.

## Shared Functionality

Regardless of type, all User Sources have the following functionality:

- **Failover Source:** If the User Source is unavailable for authentication, then a backup User Source can be specified. The type of the fail-over User Source can differ from the primary, so configurations where an internal-type fails over to a database-type are possible.
- **Schedule Restrictions:** The User Source can prevent users from logging in when they are off schedule, meaning that the schedule assigned to the user determines when the user may login.

## Main Properties

All User Sources have a section of properties that are categorized as "Main". Below is a description of these properties.

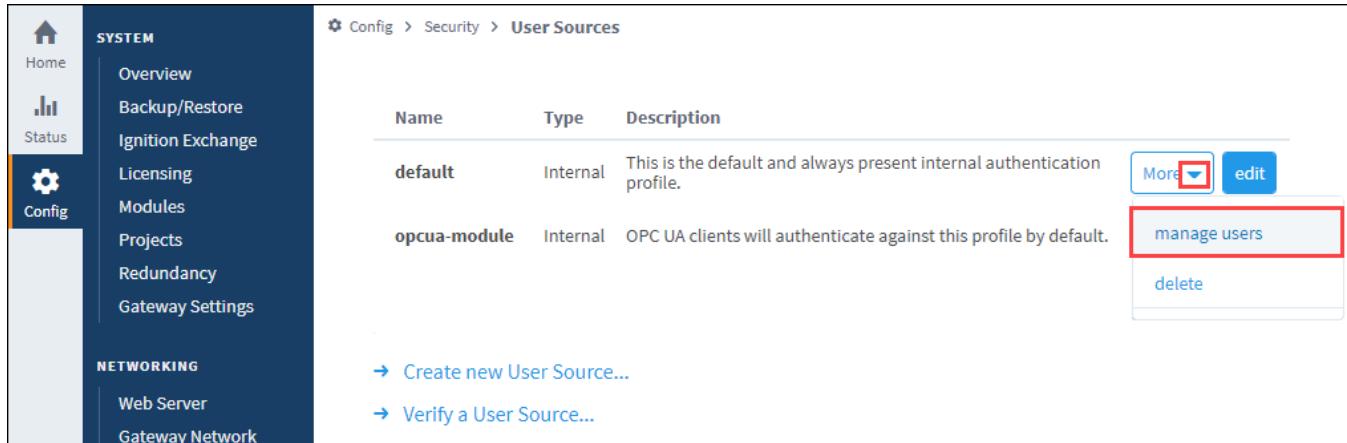
| Name                     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name                     | The name of the User Source. This is how other systems in Ignition reference the user source. Note that every User Source <b>must</b> have a unique name.                                                                                                                                                                                                                                                                                                       |
| Description              | An optional description of the user source. Useful for noting which database connection or AD server the User Source may be referencing.                                                                                                                                                                                                                                                                                                                        |
| Schedule Restricted      | Forces schedule restrictions on users. Specifically, if a user attempts to log into a client while they are off schedule, the login will fail. Utilizes <a href="#">User Schedules</a> .                                                                                                                                                                                                                                                                        |
| Failover Source          | Allows authentication attempts against this User Source to failover to another User Source in the event of a network outage, or some other connection issue. Useful with database or Active Directory user sources, as connection failures to the database/AD server will prevent users from logging in.<br><br>This property is initially set to <b>None</b> , meaning a failover User Source is not configured.                                               |
| Failover Mode            | When a <b>Failover Source</b> is configured, this property determines when the failover User Source should be consulted. The following options are available:<br><br><b>Hard:</b> The Failover User Source is only consulted when this User Source is unreachable.<br><br><b>Soft:</b> The Failover User Source will be consulted if the user's credentials fail authentication, meaning that the user typed in credentials that are unrecognized or incorrect. |
| Cache Validation Timeout | The amount of time between cache updates of the User Source. If you set this value to -1, the cache validation timeout is turned off.                                                                                                                                                                                                                                                                                                                           |
| Lockout Enabled          | Lock out a user's account after more than the maximum allowed number of failed authentication attempts occur within the lockout window. Default is true.<br><br>Note that access can be restored to all locked out users by editing the user source, and clicking the <b>Save Changes</b> button.                                                                                                                                                               |
| Lockout Attempts         | Maximum number of failed authentication attempts allowed within the lockout window before locking the user out. Default is 5. If this value is set to something less than zero (for example, -1), then the lockout functionality will be entirely disabled, regardless of what the <b>Lockout Enabled</b> property is set to.                                                                                                                                   |
| Lockout Window           | The duration of the lockout window in minutes. Default is 15. Setting this property to a value of less than zero (for example, -1) will disable the lockout functionality entirely, regardless of what the <b>Lockout Enabled</b> property is set to.                                                                                                                                                                                                           |

Details on the Password Policy Properties can be found on the [Internal Authentication](#) page.

## The Default User Source

When Ignition is installed for the first time, an internal User Source named 'default' is created. You can manage the default User Source by navigating to the **Config > Security > Users, Roles** section of the Gateway.

The manage users link next to the 'default' user source allows you to add new users, modify roles and passwords for existing users, remove users, and add/remove roles from the user source.



The screenshot shows the Ignition configuration interface. On the left, there's a sidebar with 'Home', 'Status', and 'Config' sections. Under 'Config', there are 'SYSTEM', 'NETWORKING', and 'WEB' sections. In the 'SYSTEM' section, 'User Sources' is selected. The main content area shows a table of user sources with columns for Name, Type, and Description. The 'default' user source is listed as Internal with the description: 'This is the default and always present internal authentication profile.' To the right of the table is a 'More' dropdown menu with 'edit' and 'manage users' options, and a 'delete' option below it. A red box highlights the 'manage users' link. At the bottom of the page, there are links to 'Create new User Source...' and 'Verify a User Source...'.

| Name         | Type     | Description                                                             |
|--------------|----------|-------------------------------------------------------------------------|
| default      | Internal | This is the default and always present internal authentication profile. |
| opcua-module | Internal | OPC UA clients will authenticate against this profile by default.       |

→ Create new User Source...  
→ Verify a User Source...

When you open the 'default' user source for the first time, you will see the first user that was created at installation. This is the administrator account that has full privileges. If this user source has been modified before, a list of existing users is displayed.

Config > Security > User Sources

**Users** Roles

Changes to user "admin" saved.

| Username | Name          | Roles | Contact Info                                       | Schedule |                                             |
|----------|---------------|-------|----------------------------------------------------|----------|---------------------------------------------|
| admin    | Administrator |       | email: admin@mycompany.com,<br>phone: 555-555-5555 | Always   | <a href="#">Edit</a> <a href="#">Delete</a> |
| Bob      | Driver        |       | email: bob@mycompany.com                           | Always   | <a href="#">Edit</a> <a href="#">Delete</a> |

→ Add User

## Editing a User

Choosing to edit a user will bring you to the following page allowing you to make any necessary changes to that user. Fill out the fields for that user then click **Save Changes**.

| User Properties  |                                                                                                                                                           |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name             | Description                                                                                                                                               |
| Username         | The name of the User Source. This is how other systems in Ignition reference the user source. Note that every User Source <b>must</b> have a unique name. |
| Change Password? | Check this box to change the existing password.                                                                                                           |
| Password         | New password.                                                                                                                                             |
| Password         | Re-type password for verification.                                                                                                                        |
| First Name       | First name of the user.                                                                                                                                   |
| Last Name        | Last name of the user.                                                                                                                                    |
| Roles            | Role(s) assigned to this user. Check the box next to each role you want this user to have.                                                                |
| Schedule         | Schedule for the user. Choose from a dropdown list of schedules that are already defined.                                                                 |
| Language         | Language to be used for the user. Choose from a dropdown list of languages that are already defined.                                                      |
| Notes            | Any notes for this user.                                                                                                                                  |
| Badge            | A string that represents the value set for the user's badge.                                                                                              |
| Contact Info     |                                                                                                                                                           |
| Type             | Choose email or SMS.                                                                                                                                      |
| Value            | The email value or SMS number.                                                                                                                            |

Users

Roles

### User Properties

Username

admin



Change Password?

Check this box to change the existing password.

Password

Password

Re-type password for verification.

First Name

Last Name

Roles

Administrator

Driver

Guest

Operator

In This Section ...

# Managing Users and Roles

## Users and Roles

Security is based on the roles that are assigned to specific users. Roles do not have any structure or hierarchy by default, but can be created. You can create a hierarchy based on users with a greater role being assigned all matching lesser roles.

There isn't a built-in restriction to the number of roles a user can have, so each user can have access to many roles, or none at all.

It's important to think about the different roles in your project and how they affect the security of your project. For instance, what level of access a particular area of a project needs may determine the functional type roles that you create, and the different users assigned to each role.



When using role-based security in a project, the project stores the name of the role as a string. This means that if you were to modify the name of the role in the Gateway, the role-based security in your project will not update to reflect the new name, and instead will try searching for a role with the original name. Be very careful when modifying the names of roles.

You can manage users and roles using either the Gateway interface, or using the [User Management component](#) inside the Designer or Client. This section shows how to manage users and roles using the Gateway interface.

## Create a Role

1. On the Gateway Webpage, go to the **Config** section, and choose **Security > Users, Roles** from the menu on the left. The User Sources page is displayed.
2. Click on the **manage users** link for the **User Source** you want to manage.

| Name         | Type     | Description                                                             | Actions                                                                |
|--------------|----------|-------------------------------------------------------------------------|------------------------------------------------------------------------|
| default      | Internal | This is the default and always present internal authentication profile. | <a href="#">manage users</a> <a href="#">edit</a>                      |
| opcua-module | Internal | OPC UA clients will authenticate by default.                            | <a href="#">manage users</a> <a href="#">More</a> <a href="#">edit</a> |

→ Create new User Source...  
→ Verify an User Source...

3. Click the **Roles** tab. Look for the blue arrow at the bottom, and click the **Add Role** link.
4. Name the role by entering it in the **Role Name** field, and click on the **Add Role** button. The role is now available to be associated with specific users.

## On this page ...

- [Users and Roles](#)
- [Create a Role](#)
  - [Assigning Roles to Users](#)
  - [Role Hierarchy](#)
- [Manage Users](#)
- [User Management Component](#)
  - [Save Failed. You are not authorized...](#)

The screenshot shows a 'Role Properties' form. At the top, there are tabs for 'Users' and 'Roles', with 'Roles' being the active tab. Below the tabs, the title 'Add Role' is displayed. A 'Role Name' field contains the value 'Maintenance'. At the bottom left is a link '[Cancel](#)', and at the bottom right is a blue button labeled 'Add Role'.

## Assigning Roles to Users

1. On the Gateway Webpage, go to the **Config** tab, and choose **Security > Users, Roles** from the menu on the left. The User Sources page is displayed.
2. Click on the **manage users** link for the **User Source** you want to manage.
3. Click the **Edit** link for the User you want to edit, or click the blue **Add User** link to add a new user. (When adding a new user, you can also add their roles at the same time).

The screenshot shows a 'User Sources' table. The columns are 'Username', 'Name', 'Roles', 'Contact Info', and 'Schedule'. There are two rows: one for 'admin' (Name: 'Administrator, Operator', Schedule: 'Always', with 'Edit' and 'Delete' links) and one for 'guest' (Name: 'guest', Schedule: 'Always', with 'Edit' and 'Delete' links). At the bottom left, there is a blue button labeled '→ Add User'.

4. If you're creating a new user, the Add User window will open. Enter the user's properties including the roles you want this user to have. If no roles have been created, then follow the instructions in the Creating a Role section from above. If your user already exists and you simply want to modify their roles, the Edit User window will open. (The Edit User window and the Add User window look identical).

To assign a role, there is a **Roles** property with a list of roles that have already been created. Select the role(s) that you want this user to have. (It's not required for a user to have a role, but be aware that they might not have access to an area of the project that requires them to have a role).

The screenshot shows a list of roles. The first two items are 'Administrator' (with a checked checkbox) and 'guests' (with an unchecked checkbox). The next two items are 'Maintenance Operator' (with a checked checkbox) and 'Prod\_Sups' (with an unchecked checkbox). Below these, 'Test\_Group' is listed with an unchecked checkbox.

### Administrator Role

When a project is first created, the **Administrator** role is the only role available, and no other roles will appear until they are created. When more roles are created, they appear as check boxes just like the Administrator option.

5. Click either **Add User** if you adding a new user, or **Save Changes** if you are modifying a user's role(s).  
The user now has the privileges associated with the selected role(s).

## Role Hierarchy

Often you might want to have one role that includes all the permissions for another role, i.e., Supervisor can do everything that Administration and Maintenance roles can do. In the Designer, access to Components can be restricted to specific security roles. You can give any Supervisor both of the Administration and Maintenance.

## Manage Users

User Sources support managing the users and roles from within Ignition to varying degrees. Some User Sources are fully manageable, meaning that you can administer the users, roles, contact info, and so on from within the Ignition Gateway, as well as inside a Vision Client. Other User Sources do not support this at all, while yet others only partially support it. Make sure you understand how and where the administration takes place before you choose a User Source type.

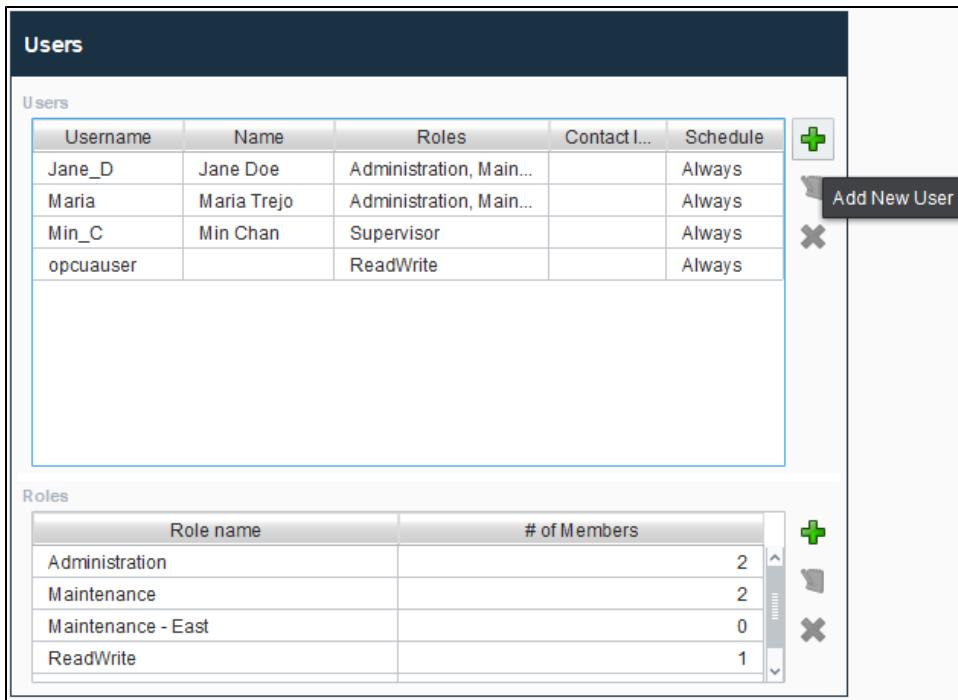
For User Sources that support it, you can manage the users and roles from within the Ignition Gateway's web configure interface under **Config > Security > Users, Roles**. Click on the **manage users** link for the **User Source** you want to administer.

Often, it is desirable to let some management or administrative users of a Vision project manage other users without having to log into the Gateway's Configure section. To do this for a User Source that supports being managed, you can simply use the built-in **User Management Panel** that comes with the Vision Module.

## User Management Component

Ignition has a special User Management component in the Vision Module that allows you to add, modify, and delete users and roles (and more) inside the Designer and the Client. This is simple to set up and use.

1. In Designer, go to the Project Browser and then to Vision.
2. Create a new Window or open an existing one.
3. Drag a **User Management** component to your window. This component will automatically point to the default user source being used by your project. You can change the User Source property if needed.
4. If you already have some users and roles setup using the Gateway Webpage, you will see them in the User Management component. If you don't have any users or roles setup, you can create them here. Use the icons on the right side to add, edit, or delete a user or role.
5. To add a new user, put the Designer in **Preview Mode**. Click the the plus  icon next to the user section.



| Username  | Name        | Roles                   | Contact I... | Schedule |
|-----------|-------------|-------------------------|--------------|----------|
| Jane_D    | Jane Doe    | Administration, Main... |              | Always   |
| Maria     | Maria Trejo | Administration, Main... |              | Always   |
| Min_C     | Min Chan    | Supervisor              |              | Always   |
| opcuauser |             | ReadWrite               |              | Always   |

| Role name          | # of Members |
|--------------------|--------------|
| Administration     | 2            |
| Maintenance        | 2            |
| Maintenance - East | 0            |
| ReadWrite          | 1            |

6. The Add User window will open. At a minimum, enter the **Username** and **Password**. All other properties are optional. When finished, click **Save**.

**Users > Add User**

< back  Save

| <b>User Properties</b>                                                                                                               |                                                                                              | <b>Roles</b>                                                                                                                                                 |       |  |  |                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Username<br><input type="text" value="Jerry_A"/>                                                                                     | Password<br><input type="password" value="*****"/><br><input type="password" value="*****"/> | <input type="checkbox"/> Administration<br><input type="checkbox"/> Maintenance<br><input type="checkbox"/> ReadWrite<br><input type="checkbox"/> Supervisor |       |  |  |                                                                                                                                                                                                                                                                                                                                                          |
| First Name<br><input type="text" value="Jerry"/>                                                                                     | Last Name<br><input type="text" value="Anderson"/>                                           |                                                                                                                                                              |       |  |  |                                                                                                                                                                                                                                                                                                                                                          |
| Schedule<br><input type="button" value="Always"/>                                                                                    | Language<br><input type="button" value="English"/>                                           |                                                                                                                                                              |       |  |  |                                                                                                                                                                                                                                                                                                                                                          |
| Notes<br><input type="text"/>                                                                                                        |                                                                                              |                                                                                                                                                              |       |  |  |                                                                                                                                                                                                                                                                                                                                                          |
| <b>Contact Info</b>                                                                                                                  |                                                                                              |                                                                                                                                                              |       |  |  |                                                                                                                                                                                                                                                                                                                                                          |
| <table border="1"> <thead> <tr> <th>Type</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> </tr> </tbody> </table> |                                                                                              | Type                                                                                                                                                         | Value |  |  | <br><br><br> |
| Type                                                                                                                                 | Value                                                                                        |                                                                                                                                                              |       |  |  |                                                                                                                                                                                                                                                                                                                                                          |
|                                                                                                                                      |                                                                                              |                                                                                                                                                              |       |  |  |                                                                                                                                                                                                                                                                                                                                                          |

7. To add a new role, make sure the Designer is in **Preview Mode**. Click the the plus  icon next to the role.
8. Enter the name of the new role. Click **Save**.

**Users > Add Role**

< back  Save

|                                                 |
|-------------------------------------------------|
| <b>Role name</b>                                |
| <input type="text" value="Maintenance - East"/> |

9. Now you can see the user and role that were just added in the User Management window.

The screenshot shows the 'Users' and 'Roles' sections of the User Management window. The 'Users' section contains a table with columns: Username, Name, Roles, Con..., and Sch... . The 'Roles' section contains a table with columns: Role name and # of Members.

| Username  | Name            | Roles                            | Con... | Sch... |
|-----------|-----------------|----------------------------------|--------|--------|
| Jane_D    | Jane Doe        | Administration, Maintenance, ... |        | Alw... |
| Jerry_A   | Jerry Anders... | Maintenance - East               |        | Alw... |
| Maria     | Maria Trejo     | Administration, Maintenance, ... |        | Alw... |
| Min_C     | Min Chan        | Supervisor                       |        | Alw... |
| opcuauser |                 | ReadWrite                        |        | Alw... |

| Role name          | # of Members |
|--------------------|--------------|
| Administration     | 2            |
| Maintenance        | 2            |
| Maintenance - East | 1            |
| ReadWrite          | 1            |

### Save Failed. You are not authorized...

By default, changes to the system's user source may not be made from this component. This prevents users from locking themselves out of the Gateway, or give themselves access to the Gateway.

However, this behavior can be overridden from the **Allow User Admin** property located under the [gateway's general security settings](#). This allows for the administration of the Gateway's system user source from the Designer and Vision Client. Unless this is enabled, the Vision Module's User Management component is prevented from modifying the Gateway system's selected user source and you will see an error at the bottom of the component if it is attempted.

#### Related Topics ...

- [Classic Authentication Strategy](#)
- [Internal Authentication](#)
- [User Management](#)
- [User Schedules](#)

#### In This Section ...

# User Schedules

Schedules define the times of users on-call availability and unavailability. For example, the **Always** schedule is a schedule that is active 24/7. You can set a schedule for each user in the alarm notification system. The notification messages are then sent only to those users with an active schedule. When a message reaches a notification block in a pipeline, that block's on-call roster is used to find the users with active schedules so they can be notified.

There are also a number of system functions that allow you to create, read, edit, and delete schedules or holidays from a user source using scripting. (i.e., `system.user.addSchedule`, `system.user.getHoliday`, etc.). To learn what system functions are available for user scheduling and holiday scripting, refer to the [Scripting Functions](#) in the Appendix.

## On this page ...

- [Define a New Schedule](#)
- [Manage User Schedules from the Vision Client](#)
- [Use Schedules for Alarm Notification](#)
- [Use Schedules for Restricting Login](#)

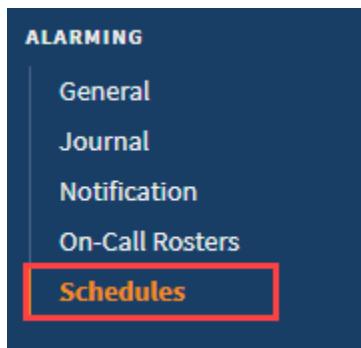


## User Schedules

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### Define a New Schedule

1. Go to the **Config** tab of the Gateway Webpage and scroll down to **Alarming > Schedules**.



2. The Schedule Management page is displayed. Here you can see an Always and an Example schedule.

The **Always** Schedule is a built-in schedule that is always available: 24x7x365.

The **Example** Schedule is an example of a M-F 8am-5pm schedule with a lunch break. Click on the **edit** to see the detailed settings.

Schedule Management

| Name    | Type              | Description                                             | Active Now? |
|---------|-------------------|---------------------------------------------------------|-------------|
| Always  | Standard Schedule | Built-in schedule that is always available: 24x7x365    | Yes         |
| Example | Standard Schedule | An example of a M-F 8am-5pm schedule with a lunch break | No          |

[Create new Schedule...](#)

3. Click on **Create new Schedule**.
4. For our example, we'll set up a new Standard schedule. Enter a schedule name, description, and set the hours.  
 Name: **Weekend Basic**  
 Description: **Regular Weekend schedule, no holidays**  
 All days: **No** (Unselect this option)  
 Saturday: Yes (Select this option)  
 Sunday: Yes (Select this option)

Schedule Management

**General**

|                  |                                                                                                |
|------------------|------------------------------------------------------------------------------------------------|
| Name             | Weekend Basic                                                                                  |
| Description      | Regular Weekend schedule, no holidays.                                                         |
| Observe Holidays | <input type="checkbox"/> Choose whether or not this schedule observes any configured holidays. |

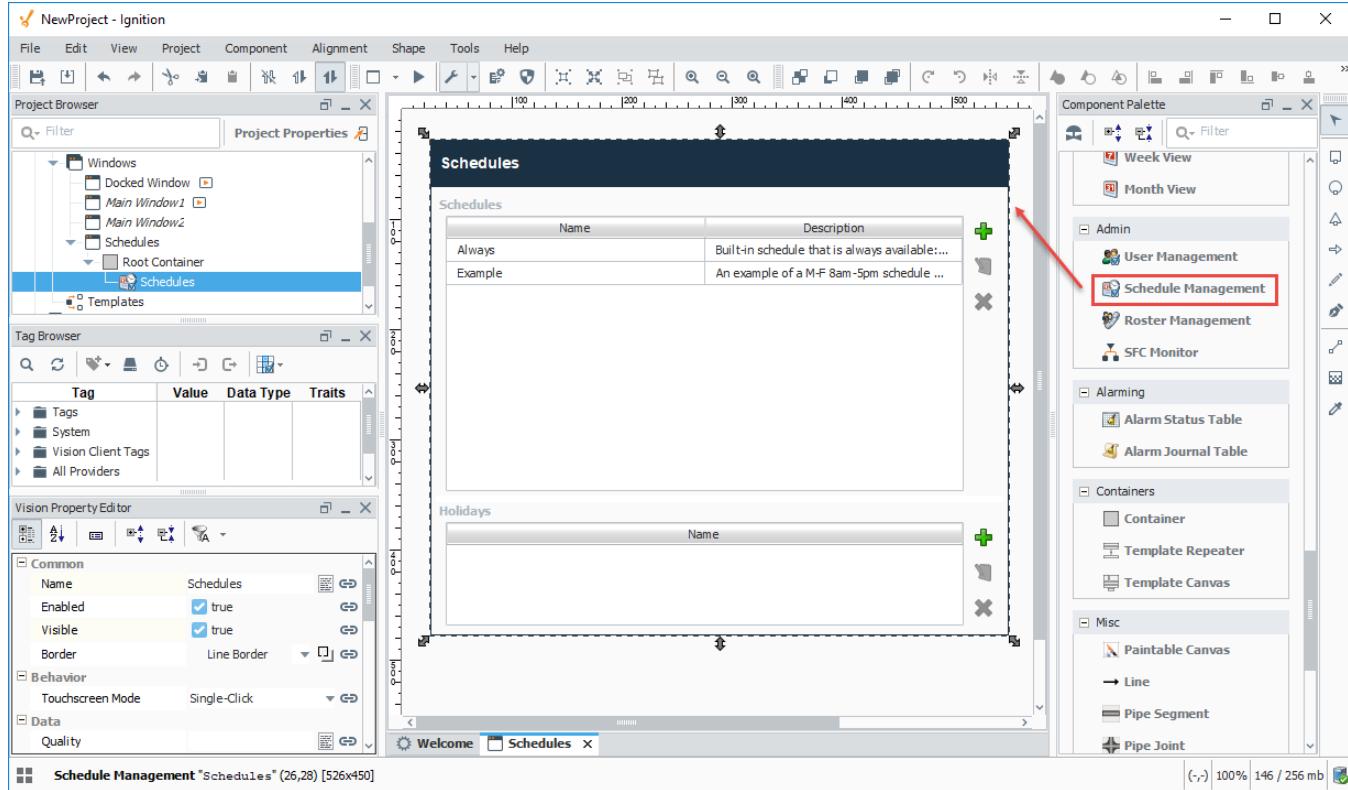
**Schedule**

|          |                                                                                                         |
|----------|---------------------------------------------------------------------------------------------------------|
| All days | <input checked="" type="checkbox"/> 0:00-24:00<br>This schedule will have the same hours 7 days a week. |
|----------|---------------------------------------------------------------------------------------------------------|

5. Click **Add Schedule**.

## Manage User Schedules from the Vision Client

There are a few ways to manage user schedules from the Vision client. The first is to use the [Schedule Management](#) component on a window. This component allows you to quickly and easily manage the schedules from the Vision client.



For more granular control, you may instead want to use scripting to manage the schedules. This may offer a more granular control at the click of a button.

```
# This code creates a new schedule by using an old schedule but setting observe holidays to true.
mySchedule = system.user.getSchedule("WeeklySchedule")
if mySchedule != None and mySchedule.getType() == "basic schedule":
    mySchedule.setObserveHolidays(True)
    mySchedule.setName("NewWeeklySchedule")
    system.user.addSchedule(mySchedule)
```

## Use Schedules for Alarm Notification

The alarm notification system always uses the Schedules. When an alarm notification pipeline reaches a notification block, it looks at all of the users defined in that block's configured [on-call roster](#). Only those users whose schedules are currently active will be notified. This way, you can group people in call rosters by role, not by shift. For example, suppose you have alarms that should be sent to all supervisors. You can put all of the supervisors in one call roster, and the scheduling system will automatically only notify those supervisors who are on-shift when the alarm goes active.

## Use Schedules for Restricting Login

You can use Schedules to restrict users' ability to log in. To enable this, select the **Schedule Restricted** option on the user source in question. That user source will then reject logins for users whose schedule is inactive, even if their credentials were accurate.

### Related Topics ...

- [On-Call Rosters](#)
- [User Notifications](#)



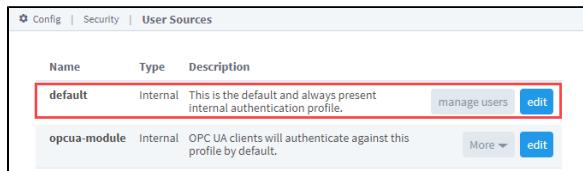
# Internal Authentication

## Internal User Sources

An Internal type User Source stores user information internally in the Gateway's database. This means that Internal User Sources are included in Gateway Backup files, and don't require an external SQL database, or other external user management system.

When Ignition is first installed, the [default User Source](#) that initially grants access to the Gateway and Design is an Internal type User Source. You can, of course, continue to use this default internal User Source for your project(s), or you may choose to use other User Sources instead.

The Internal User Source is fully [manageable](#) from within Ignition. You can access User Sources from the Gateway Webpage under the [Config](#) section, [Security > User, Roles](#), and click the [edit](#) button.



| Name         | Type     | Description                                                             | Actions                                           |
|--------------|----------|-------------------------------------------------------------------------|---------------------------------------------------|
| default      | Internal | This is the default and always present internal authentication profile. | <a href="#">manage users</a> <a href="#">edit</a> |
| opcua-module | Internal | OPC UA clients will authenticate against this profile by default.       | <a href="#">More</a> <a href="#">edit</a>         |

## On this page ...

- [Internal User Sources](#)
- [Property Reference](#)
  - [Main Properties](#)
  - [Password Policies Properties](#)



## Internal Authentication

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## Property Reference

This section details Internal User Source properties, organized by category.

### Main Properties

Details on the Main Properties can be found on the [User Sources](#) page.

### Password Policies Properties

The Internal User Source has password policies that are configurable from within the Gateway to provide an extra layer of security by ensuring that good password practices are used.

1. From the [Config](#) tab in the [Gateway Webpage](#), select [Users, Roles](#).
2. Click the Edit button for the User Source you want to update.
3. Scroll down to the Password Policy section. You can change the default password policies by entering the appropriate password values to support your password policies.

| Password Policy     |                                                                                                                                                                                                                                                   |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Password Max Age    | 90<br>The maximum age (in days) that a password is valid for. A value of zero disables password expiration.<br>(default: 0)                                                                                                                       |
| Password Min Length | 10<br>Passwords must be at least this many characters long.<br>(default: 1)                                                                                                                                                                       |
| Password Complexity | 2<br>The number of character types (lowercase letters, uppercase letters, digits, punctuation) each password must contain. For example, a value of 3 means passwords must have 3 of the 4 character types to be considered valid.<br>(default: 1) |
| Password History    | 3<br>The number of previous passwords to store. Passwords in the history list may not be re-used. A value of zero disables this feature.<br>(default: 0)                                                                                          |

Below is a description of the Password Policy properties.

| Name                    | Description                                                                                                                                                                                                                                                                                                                |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Password Maximum Age    | The maximum age in days that the password will still be valid. After the number of days has past, when the user tries to login, it will prompt them to change their password. A value of 0 will disable this feature.                                                                                                      |
| Password Minimum Length | The minimum amount of characters that a password must contain to be considered valid. If the user tries to make a shorter password, it will not allow it, and let them know that it does not meet the minimum length requirements.                                                                                         |
| Password Complexity     | This determines how complex a password must be. There are four character types: lowercase letter, uppercase letter, digits, and special characters. The value here determines how many of those character types must be present at least once in the password for it to be considered valid.                               |
| Password History        | Determines the number of previously used passwords to store. When users make a new password, old passwords can not be re-used. A value of zero disables this functionality. History is only stored while this setting is turned on, so any passwords used while this is off can be re-used when history is turned back on. |

#### Related Topics ...

- [Database Authentication](#)
- [Active Directory Authentication](#)
- [AD Internal Hybrid Authentication](#)
- [AD Database Hybrid Authentication](#)
- [Identity Provider Authentication Strategy](#)
- [User Management](#)
- [Managing Users and Roles](#)
- [Security](#)

# Database Authentication

## Database User Source

The Database Authentication type uses an external database instead of storing data inside Ignition. Managing users is done via direct interaction with the database. This section addresses how to setup a database user source. The Database Authentication type requires you have a connection to an existing database, like SQL Server, Oracle, or MySQL. It stores all users, roles, schedules, and more in the database, and uses queries to check login credentials. When you create a database user source, you have the option of setting it up in Automatic or Manual mode.

### Automatic Mode

In Automatic mode, Ignition will create and manage the database tables for you. You can specify a prefix for the tables that are created automatically for you, but their names after the prefix are chosen by the user source. In this mode, the user source will be fully [manageable](#) in Ignition.

### Manual Mode

In Manual mode, you must provide SQL queries for various functions of the user source. In this mode, the user source will not be manageable from the Gateway or the Clients. You'll have to manage the users directly through the database. Examples for each of the queries are given on the user source setup page. Read each query description carefully to make sure you design your queries to return all the columns that are defined in the query's description as shown below.

## Property Reference

Database User Sources have the following properties, organized by category

### Main Properties

Details on the Main Properties can be found on the [Classic Authentication Strategy](#) page. The Database User Source also has the following properties:

| Name     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Database | The database connection this User Source will retrieve user information from.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Mode     | How the Gateway should manage the database tables. Has two settings:<br><b>Automatic:</b> The gateway will automatically create the database tables necessary, and all interactions with the table will use the built-in queries. When this option is set, the <b>Tablename Prefix</b> property is utilized.<br><b>Manual:</b> The Gateway will not automatically create any database tables, nor will it automatically modify users or roles. When set to manual, it is assumed that you want to manually write the queries that update the tables, or are utilizing another system. When Mode is set to this option, the <b>Manual Mode</b> properties are used to determine how the Gateway should query user data. |

### Automatic Mode Properties

| Name             | Description                                                                                                                                                                                                         |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tablename Prefix | When set to <b>Automatic</b> mode, this property determines the prefix that will be used on all automatically created tables. Useful when multiple database User Sources are connected to the same database scheme. |

### Manual Mode

| Name                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Authentication Query | A query that <b>must</b> return a row if the given username and password combination provided is valid. The query will run as a prepared statement, so use the question mark character (?) to represent username first and then password. The returned row may contain the user's basic properties under the column names: [firstname, lastname, schedule, language, notes]<br><br>Note that the Gateway will pass both the username and password the user typed in, so this query <b>MUST</b> utilize exactly two question marks, otherwise an exception will occur. |

## On this page ...

- [Database User Source](#)
- [Property Reference](#)
  - [Main Properties](#)
  - [Automatic Mode Properties](#)
  - [Manual Mode](#)
- [To Create a Database User Source](#)



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## Database Authentication

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|                           |                                                                                                                                                                                                                                                                                                                                |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| List Roles Query          | A query that returns all possible roles that any user could be a member of. The role names must be returned in the first column of the query's results.                                                                                                                                                                        |
| User's Roles Query        | A query that returns all of the roles that the provided user belongs to. The roles must be strings and must be in the first column of the query's results. The query will be run as a prepared statement with one parameter: the username.                                                                                     |
| List Users Query          | A query that returns a row containing each username. There must be at least one column: the username. Other columns are optional, supported columns are: [username, firstname, lastname, schedule, language, notes].                                                                                                           |
| Contact Info Query        | A query that returns all of the contact info for the user. The first column must be the contact type, the second column the contact value. Optional, may be blank.                                                                                                                                                             |
| Schedule Adjustment Query | <p>A query that returns the upcoming schedule adjustments for the user. This property is optional, and may be left blank.</p> <p>The results set expects the following columns:</p> <ul style="list-style-type: none"> <li>• Start(date)</li> <li>• End(date)</li> <li>• Available(boolean)</li> <li>• Note(string)</li> </ul> |
| Extra Properties Query    | A query that returns name, value pairs of extra properties for the user. Will be run with one parameter: the username. Optional, may be blank.                                                                                                                                                                                 |

## To Create a Database User Source

1. On the Gateway Webpage under the **Config** tab, go **Security > Users, Roles**.  
The User Sources page will be displayed. Click the blue arrow, **Create new User Source**.
2. Choose the **Database** authentication type, and click **Next**.

