Electric Cloud

ElectricFlow 6.x
Agent Configuration Guide

ElectricFlow 6.x

Contents

Introduction to ElectricFlow Agents

ElectricFlow™ (formerly known as ElectricCommander) accelerates the continuous delivery of software and makes software delivery processes more repeatable, visible, scalable, and efficient. It provides domain-specific capabilities to automate the build, test, package, deploy, and release processes across many delivery pipelines.

ElectricFlow is built on a powerful proven automation platform that natively integrates domain-specific capabilities for Enterprise-level continuous delivery. The automation platform gives distributed DevOps teams shared control and visibility into infrastructure, tool chains, and processes. It accelerates and automates the software delivery process and enables agility, availability, predictability, and security across many build-test, deployment, and release pipelines.

This document describes how to install, configure and use agents (including proxy and remote) in ElectricFlow. An agent is an ElectricFlow component that runs on a machine resource. It executes ElectricFlow job steps, monitors step progress, and records job completion information.

To learn more about how agents interact with ElectricFlow components (such as resources, artifacts, and workspaces) and capabilities (such as Change Tracking, credentials, and user impersonation), use the information in this document with the agent-related information in the *ElectricFlow User Guide*, *ElectricFlow Help Guide*, and *ElectricFlow API Guide* on the ElectricFlow documentation site.

To learn more about agents, also see the "Getting Started Scenarios Help Topic Series" section and the "Tutorials" section in the ElectricFlow Help topics.

ElectricFlow Architecture

ElectricFlow was designed to support small, mid-range, or enterprise scale software production. Based on a three-tier architecture, ElectricFlow scales to handle complex environments. The ElectricFlow multi-threaded Java server provides efficient synchronization even under high job volume.

- The ElectricFlow server manages resources, issues commands, and generates reports.
- An underlying database stores commands, metadata, and log files.
- Agents execute commands, monitor status, and collect results in parallel across a cluster of servers for rapid throughput.

Simple Architectural Overview

This local configuration applies to all the use cases. The ElectricFlow server, web server, artifact cache, Artifact Repository server, workspace, command-line tools, resources, agents, and job steps are all in the automation platform.

In this local configuration:

- The ElectricFlow server manages resources, issues commands, and generates reports.

- Resources, agents, and databases are managed in the automation platform.

- An underlying database stores commands, metadata, and log files.

- Procedures, which include job steps, are defined in the automation platform.

- Job steps are executed on resources in the defined environments.

- Applications (which include procedures), components, and environments are defined for deployment automation.

- Pipelines, stages, and tasks are defined for pipeline management.
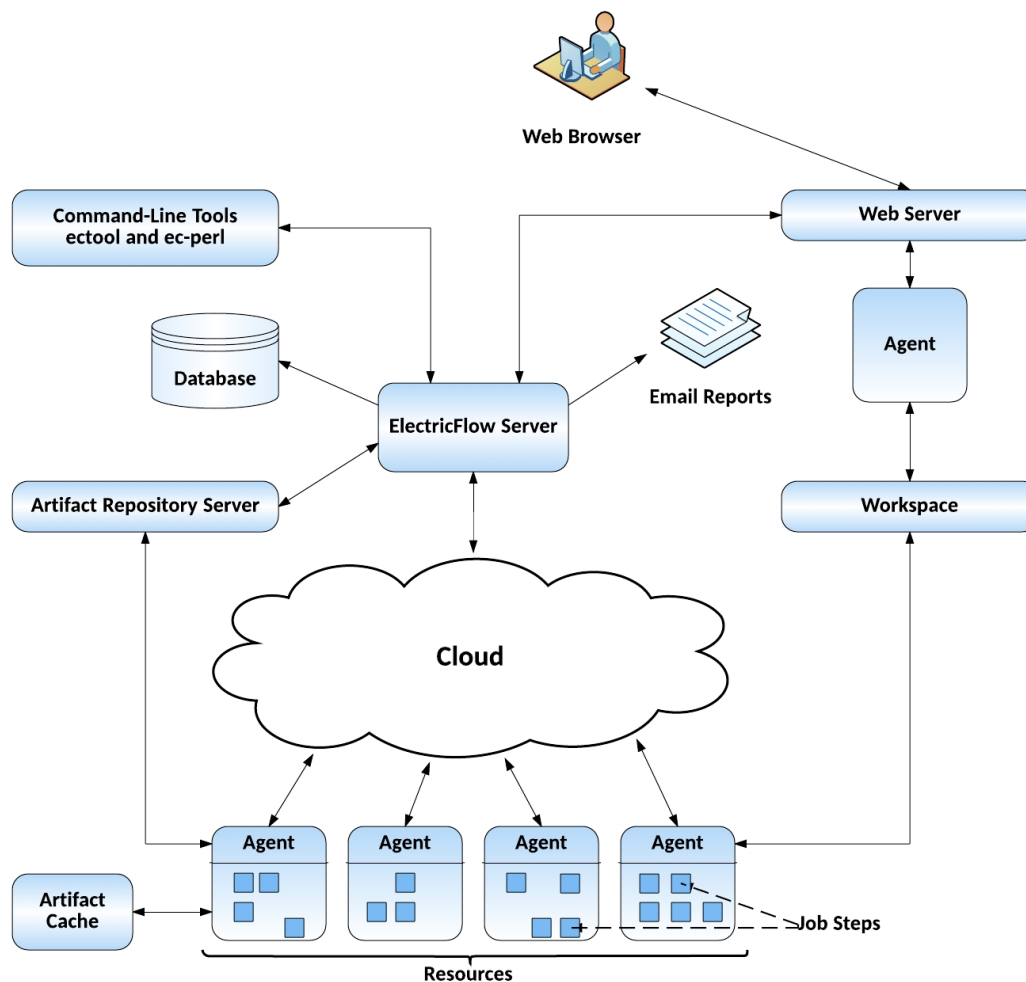
If you are only evaluating ElectricFlow, the ElectricFlow software, the database, the ElectricFlow server, the web server, and the repository server can reside on the same machine.

In a production environment, the database should reside on a separate machine from the ElectricFlow server to prevent performance issues. It is acceptable for the ElectricFlow server, web server, and repository server to reside on the same machine in a local configuration, but not required.

Expanded Remote Configuration

ElectricFlow is not limited by only the components shown in the previous configuration. This configuration applies to all the use cases.

The following shows a remote web server configuration and is an example for how you may set up a remote web server installation.
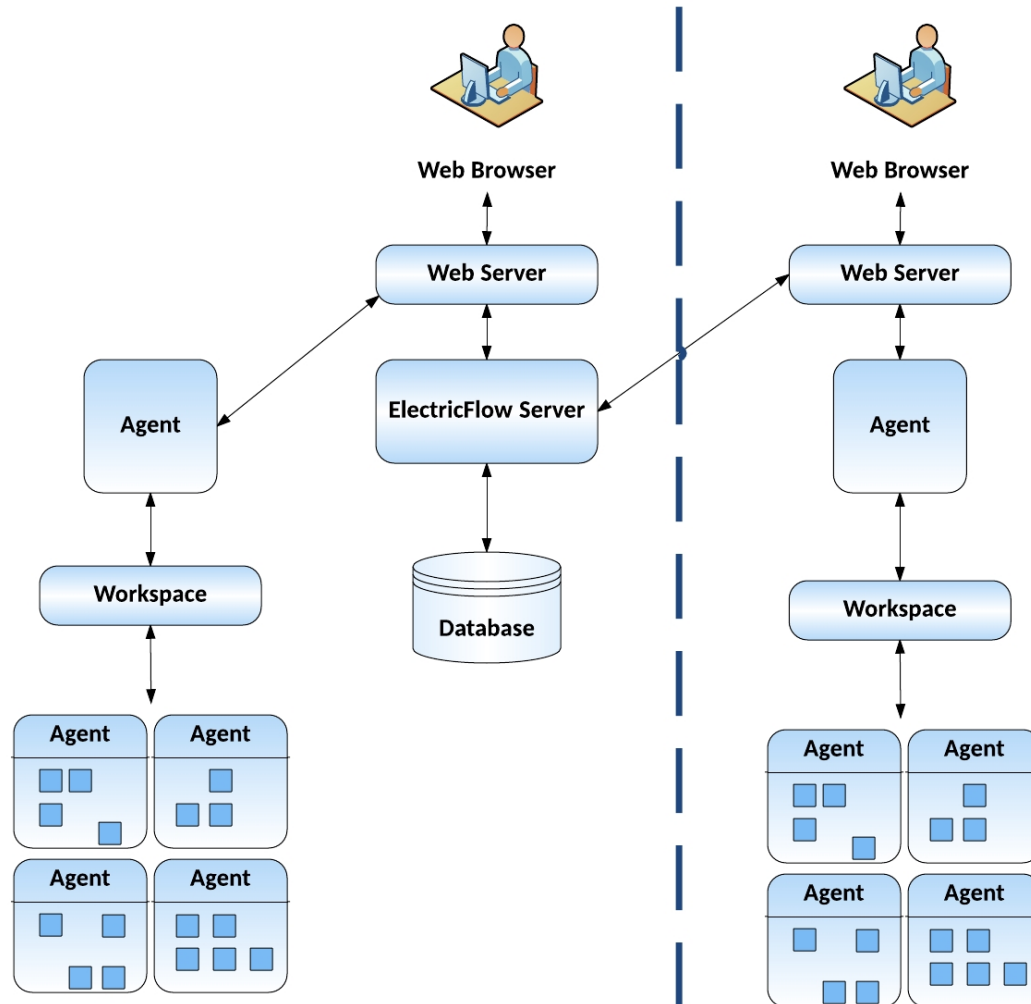
This type of remote web server configuration helps prevent network latency. If you have multiple sites, ElectricFlow can be configured to help you work more efficiently.

Other Configurations

- Proxy (universal) resources
- Remote database
- Multiple remote web servers

- Multiple remote repository servers
- Configurations designed specifically for *failover*

Agents in ElectricFlow

ElectricFlow agents interact with most ElectricFlow objects and take part in ElectricFlow operations. An agent is an ElectricFlow component that runs on a machine resource. Using resources defined on an agent, an agent is able to execute ElectricFlow job steps, monitor step progress, and record job completion information.

This document has the following agent-specific information.

- Resources

  A resource specifies an agent machine where job steps can execute.

  A standard resource specifies a machine running an installed ElectricFlow agent on one of the supported agent platforms. For the list of supported platforms, see the *ElectricFlow Agent Installation Guide* or the *ElectricFlow Installation Guide* on the ElectricFlow documentation site.

  A proxy agent is connected to a proxy target.

  A proxy target is a machine on an unsupported platform that can run commands via an SSH server.

  A proxy resource specifies a proxy agent or target on a remote platform or host in your environment. This host has no agent installed, but may require the tools installation to perform certain operations.

- Zones and gateways

  A gateway resource specifies an agent (referred to as a *gateway agent*) that communicates with a gateway agent in a different zone through a firewall.

- Remote agents

  A remote agent runs on a remote machine resource.

- Trusted and untrusted agents

  If an agent is trusted, the ElectricFlow server verifies the agent's identity using SSL certificate verification when connecting a resource to another resource.

  If an agent is untrusted, the ElectricFlow server does not verify the agent's identity. An untrusted agent may be a security risk.

- What happens to agents in job steps

- For more information:

Objects or Operation	Go to ...
Resources	About resources: Standard Resources on page 11 and Proxy Resources on page 11 Setting up resources: Configuring Resources on page 14
Zones and gateways	About zones and gateways: Gateways and zones on page 12 Setting up zones and gateways: Configuring Zones on page 42
Remote agents	Installing and upgrading: Install or Upgrade Remote Agents on page 32

Objects or Operation	Go to ...
Trusted and untrusted agents	Setting: Switching a non-trusted agent to trusted on page 31
What happens to agents in job steps	User guidelines and best practices: User Guidelines and Best Practices on page 9
How agents interact with other ElectricFlow objects and operations	*ElectricFlow Help Guide*, and *ElectricFlow API Guide* on the ElectricFlow documentation site.

User Guidelines and Best Practices

Keep the following in mind as you configure and use ElectricFlow agents:

- When a procedure has steps defined by commands, each step is run in a separate command shell.

  Make sure to set an environment variable for each step defined by a command. If you do not, setting the environment variable in the first step does not make it available in subsequent steps.

- An agent returns a success or failure based on the last command run in the step.

Setting Up Resources

Select **Cloud** > **Resources** to view the Resources page.

Before resources can be configured, you need to know which agent machines are available to allocate to jobs. The Resources page displays all resources currently available to the ElectricFlow server. This page is your Resources management center where you can create, modify, or delete resources and see the resource status.

To view the Resource Pools page where you can manage the resource pools in ElectricFlow, go to **Cloud** > **Pools**.

To view the Zones page where you can manage the zones in ElectricFlow, go to **Cloud** > **Zones**.

What is a Resource?

A *resource* is defined as an agent machine where steps can execute. In addition:

- Each resource has a logical name.

- Each resource refers to an agent machine by its host name.

- Multiple resources can be defined on the same physical host.

- Each resource can be assigned to one or more pools, or one zone.

- Each resource has a step limit that determines the maximum number of steps that can execute simultaneously on the resource.

  In Create/Edit Resource panels, you define the number of steps that can run on a resource. Remember that setting the Step Limit to "0" or leaving the field blank defaults to no step limit.

  When ElectricFlow allocates resources for a job and steps are executed on the resource, it considers the step limit, not the CPU load from the steps . The step limit for a resource in your system depends on the agent machine performance. For example, using *unlimited* as the step limit for a heavy load can slow the agent and result in less consistent agent performance if this is not managed properly.

What is a Pool?

A pool is a group of interchangeable resources. For example, you might have a pool of Windows servers.

Naming a pool in a procedure step allows ElectricFlow to assign any resource from that pool to do the work for that step. By default, ElectricFlow will try to balance the requests against the set of resources in the pool, but you can also define your own rules for how resources will be selected.

To define a resource for a procedure step, you can do the following:

- Specify a resource or a pool name in a procedure step to execute that step on that resource/pool.

- Define custom properties for your resources or resource pools.

- Mark a resource as "exclusive" (the step acquires and retains its resource exclusively)..

For example, if configuration information varies from resource to resource, you can use custom properties to hold this information and then reference it from procedure steps where it is needed. Suppose you have a pool of test machines where the test hardware is in a different location on each machine. You could define a property

named "testLocation" on each resource, then pass this property to procedure steps using a reference such as $[/myResource/testLocation]. This approach allows you to define procedure steps to run on any resource and automatically handle configuration differences.

Note: When the ElectricFlow server and agents are installed on different hosts, make sure that the configuration for each agent specifies the Domain Name System (DNS) server.

ElectricFlow Supports Two Resource Categories

- Standard
- Proxy

Standard Resources

This resource category specifies a machine running an installed ElectricFlow agent on one of the supported agent platforms, as specified in the *ElectricFlow Installation Guide*, Chapter 2, "System Requirements and Supported Platforms."

Proxy Resources

This resource category requires SSH keys for authentication. You can create proxy resources (agents and targets) for ElectricFlow to use on numerous other remote platforms/hosts that exist in your environment. A proxy agent is an ElectricFlow agent, channeling to a proxy target.

- **Proxy agent** - This is an agent on a supported Linux or Windows platform, used to proxy commands to an otherwise unsupported platform. A proxy agent is an ElectricFlow agent, channeling to a proxy target.
- **Proxy target** - This is a machine on an unsupported platform that can run commands via an SSH server. Proxy targets have limitations, such as the inability to work with plugins or communicate with ectool commands.

When a step is running on a proxy resource, the proxy agent performs the following tasks:

- Uploads the commandFile to the Working Directory on the proxy target via SSH.
  - Working Directory - the step runs in this directory on the proxy target, which defaults to the UNIX path to the workspace
- Creates a wrapper sh shell script to:
  - CD to the Working Directory
  - Set COMMANDER_environment variables that exist in the proxy agent's environment
  - Run the commandFile that was uploaded earlier
- Uploads the wrapper script to the Working Directory on the proxy target
- Runs the wrapper script on the proxy target
- Cleans up script files on the agent and proxy target

Setting up SSH keys

If you are not familiar with setting up SSH keys, go to the knowledge-based article called "Setting up SSH Keys in preparation to use a Proxy Agent" in the Electric Cloud Support Web Site:

1. Go to https://electriccloud.zendesk.com/hc/en-us/categories/200176553-ElectricCommander.

2. In the ElectricFlow KB section, enter **KBEC-00049** in the Search field.

3. Click **Search**.

4. Click the link to the knowledge-based article called "KBEC-00049 - Setting up SSH Keys in preparation to use a Proxy Agent" to open it.

On UNIX, the ElectricFlow agent looks in the `~/.ssh` directory for the private and public key files to set up the SSH connection to the proxy target. Therefore, Electric Cloud recommends generating your key files in that directory.

On Windows, the ElectricFlow agent does not presume a default location. Therefore, in the proxy resource definition you must specify the key file location. Enter the following line in the resource "Proxy Customizations" field:

```
setSSHKeyFiles('c:\ foo\priv.key');
```

To create a new resource

Click the Cloud tab in the ElectricFlow web interface to go to the Resources page.

At the top right-side of the table, click the down arrow next to the plus sign and select **Create Resource** or **Create Proxy Resource** link to see the New Resource or New Proxy Resource panel.

From either panel, New Resource or New Proxy Resource, click the **Help** link in the upper-right corner of the page to access the Resources Help topic to see descriptions and other information to assist with filling-in the fields.

Gateways and zones

ElectricFlow provides the capability of establishing security zones for agents and repository servers.

What is a zone?

A zone consists of a collection of resources that can directly communicate with each other. Within a large corporation, a zone may encapsulate a physical site, and communication between any two sites occurs through firewalls.

What is a gateway?

The details of this connection information are recorded in a gateway object in ElectricFlow. Using the example in Cross-zone communication on page 13as a reference, a gateway object consists of the following information:

- Name of a gateway resource in one zone (GatewayAgent1)

- Name of a gateway resource in another zone (GatewayAgent2)

- Host/port GatewayAgent2 uses to communicate with GatewayAgent1 (for example, the firewall IP address in ZoneB)

- Host/port GatewayAgent1 uses to communicate with GatewayAgent2 (for example, the firewall IP address in ZoneA)

Cross-zone communication

The following figure shows an example gateway and zone configuration with two zones and three machines.

Cross-zone communication is managed by proxying requests through specially marked resources called "gateway resources". In the previous example, if the ElectricFlow server wants to run a command block process step on an agent in Zone B, it issues its request through GatewayAgent1. The request includes extra metadata that instructs GatewayAgent1 to forward the request to the target agent. The firewall is configured to allow connections from GatewayAgent1 to GatewayAgent2. It is also configured to allow connections from GatewayAgent2 to GatewayAgent1. This is necessary because API communication (CLI commands and the step completion message) is sent from GatewayAgent2 on its own outbound connection to the server (through GatewayAgent1).

Because the firewall separates two private networks, there's no guarantee that IP address ranges in one network do not overlap with those of the other. When either gateway agent wants to connect to the other, the gateway agent uses an IP address to the firewall that is valid for its side of the firewall.

Support for gateways

The previous example shows two zones for simplicity, but ElectricFlow supports an unlimited number of zones, including chained zones. For example, if a third zone called Zone C is only accessible from Zone B via GatewayAgent3 (in Zone B) and GatewayAgent4 (in Zone C), the server could issue a request to GatewayAgent1, which forwards the request to GatewayAgent2, which forwards it to GatewayAgent3, which forwards it to GatewayAgent4.

Also, for resiliency, ElectricFlow supports having multiple gateway agents between two zones. If one gateway agent goes down, the system will detect the failure and route all requests through the other gateway agent.

Configuring Resources

The **Cloud** > **Resources** page displays all resources known to this ElectricFlow server and provides easy access to resource configuration and all other resource management functionality.

- Each resource has a logical name—a unique name to distinguish this resource from other resource names.

- Each resource refers to an agent machine by its host name.

- Each resource can be assigned to one or more pools.

  A *pool* is a group of interchangeable resources. For example, you may have a pool of Windows servers.

  If you name a pool in a procedure step, ElectricFlow can assign any resource in the pool to that step, which allows ElectricFlow to choose a lightly loaded resource. You can change the resources in a pool without having to modify any procedures that use the pool.

- Each resource can be assigned to a zone. A default zone is created during ElectricFlow installation and all resources, by default, are members of that zone until they are assigned to a different zone.

  A *zone* is a collection of agents. Every agent, and all resources defined on that agent, belong to only one zone . When ElectricFlow is installed, a *default* zone is created. If a zone is deleted, all agents in that zone are moved to the *default* zone. The ElectricFlow server resides in the default zone.

    Note: The *default* zone *cannot* be deleted.

- Several resources can correspond to the same physical host or agent machine.

- When you specify a resource name in a procedure step, the step executes on that resource.

Supported Resource Categories

- **Standard**-This category specifies a machine running the ElectricFlow agent on one of the supported agent platforms, as specified in the *ElectricFlow Installation Guide*.

- **Proxy**–This category requires SSH keys for authentication. You can create proxy resources (agents and targets) for ElectricFlow to use on other remote platforms or hosts that exist in your environment.

  - Proxy *agent*–This is an agent on a supported Linux or Windows platform, used to proxy commands to an otherwise unsupported platform. A proxy agent is an ElectricFlow agent, channeling to a proxy target.
  - Proxy *target* –This is a machine on an unsupported platform that can run commands through an SSH server. Proxy targets have limitations, such as the inability to work with plugins or communicate with ectool commands.

Help topic "Best Practice": We recommend reviewing this Help topic in its entirety to become familiar with new resource management features and expanded functionality. Later, when using the Resources page, use the following quick links to go to the Help section that you need to review.

Icons, Links, and Buttons Above the Table

Table view - column descriptions

Grid view

Resource Page Information and Functions

Immediately after the *Resources* title above the table, you can see how many licensed resources are currently in use.

Links, Icons, and Buttons Above the Table

Hover your mouse over an icon or button to see the available actions. You can select one of these actions on a single resource or on multiple resources (selected using the check box in the first column) to perform the action on one or more resources at the same time.

- Select one or more resources from the table, and then select the button to perform the task or action.

- **Exception**: When you click the **Action** icon   and select **Create Resource** or **Create Proxy Resource**, a panel opens where you can create one of these new objects. You can create only one object at a time.

Icon or Link Name	Description

+ ▾	Select one of these actions:
	
	• **Create Resource**–The **New Resource** panel opens. For information about the fields, see the New Resource section.
	
	• **Create Proxy Resource**–The **New Proxy Resource** panel opens. For information about the fields, see the New Proxy Resource section.
	
	• **Install Resource(s)**–A dialog box opens where you enter information about the agents to install. For more information, see Install or Upgrade Remote Agents on page 32.
	
	    Note: If you are upgrading one or more agents or resources, the label on this option is **Upgrade Resource(s)**, which is available only for Linux agents . You cannot install or upgrade Windows agents using this process.
	
	    IMPORTANT: If the EC-AgentManagement plugin is not installed, you will not see this option.

⧉	**Copy Resource**–Makes a duplicate copy of one or more resources that you selected.
🗑	**Delete Resource**–Deletes one or more resources that you selected. **Note:** If a resource is on a "gateway agent", the gateway will be deleted.
◎	**Ping Resource**–ElectricFlow pings one or more resources to check if they are available. When ElectricFlow "pings" a resource, it sends a message to the agent (for the resource) to make sure the agent is alive and running a version of software compatible with the ElectricFlow server. After the ping completes (or fails), the page refreshes to reflect the current resource state. **Note:** A gateway must exist before you ping a resource in a remote zone.
✓	**Enable Resource**–Enables one or more resources that you selected in the check boxes in the first column..
—	**Disable Resource**–Disables one or more resources that you selected in the check boxes in the first column.

Icon or Link Name	Description

✏️ ▾	Select one of these actions:
	
	• When you click the button with no resources selected, the *Select some resources to edit* message appears.
	
	• When you select resources and click this button, these options appear:
	
	  • **Add to Pool**–Adds the selected resources to a pool.
	  • **Remove from Pool**–This is available only if all the selected resources have at least one pool in common. If not, this link becomes **Remove from Pool** *<name>*.
	  • **Move to Zone**–Moves the selected resources to a zone.
	  • **Set Trusted**–This is not available if the selected resources are already *trusted*. If not, all the selected resource will be changed to *trusted*.
	  • **Unset Trusted**–This is available only if all the selected resources are trusted. If not, the selected resources will be changed to *untrusted*.

☆ ⭐ or	Select this button to add this Resources page to your Home page for one-click access to return to this page. If the icon is yellow, the page is already accessible from your Home page .
New Search link	Use this link to go to the Define Search page if you need to search for a particular object or set of objects. For example, job, resource, artifact, workflow, and so on. Use the "back" button to return to the Resources page.

Table view - column descriptions
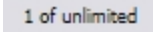
Not all resource configuration information is displayed within the table, but you can see all other information about the resource when you edit the resource or access other slide-out panels. For example, the action to see or add access control privileges to a resource is available on the Edit Resource panel or from the **Access Control** link on that panel.

Note: Most column headings can be sorted. Click on a column heading to re-sort the information in that column.

Column name / icon	Description
☐	Select this check box to enable the corresponding resource in that row for a single or batch action. For example, deleting or enabling multiple resources at the same time is a batch action. **Note:** If you select this icon in the table header row, it will select or deselect all resources in the table.

Column name / icon	Description
	Status of the agent. If an agent machine is not available, any resources associated with that host will not be available. **Note:** If an agent is down, the ElectricFlow server is not able to provide additional information about the cause.
Name	Name of the resource. The icon to the left of the resource name indicates whether this resource is *enabled* or *disabled*. These icons are: Enabled or Disabled If a resource is disabled, no job steps are assigned to it. If a step requests a particular resource and that resource is disabled, the step waits until the resource becomes enabled again. If the resource is in a pool, ElectricFlow uses any enabled resource in the pool to satisfy the request for the resource. Other actions: • To change the enabled or disabled icon, select the check box (in first column) in the row for one or more resources, and then select the enabled or disabled icon above the table. Select multiple resources if this is a batch change. **Note:** You can change the resource enable/disable specification from the Edit Resource panel too, but this is an individual operation for one particular resource. • Click on a resource name to see the Resource Details panel - this panel displays how your resources is configured currently. To make changes, click the **Edit** link to go to the Edit Resource panel.
Pools	A space-separated list of pool names where this resource is a member. **Note:** Spaces are not allowed within a pool name.
Type	A resource can be *static* or *dynamic*. • A static resource is part of your system or network (not in the cloud), such as a server, database, or agent machine. • A dynamic resource is a cloud resource that can be provisioned and later spun up on-demand when an application is deployed.
Resource Template Name	The name of the resource template to which the resource is applied. **Note:** Only dynamic resources can be applied to a resource template.

Column name / icon	Description
Time running	If the resource is a dynamic resource, how long it has been running.
Job Status	Indicates the current job status with the following icons: *Running job* - a job is still running, which means the resource is currently being used for one or more jobs. The names of all jobs using the resource are displayed next to the icon. *Success* - the job running on this resource completed successfully. *Error* - the job running on this resource encountered an error and may or may not have completed. One or more error messages will be listed in this column. *Warning* - the job running on this resource encountered a warning and may or may not have completed. One or more warning messages will be listed in this column. *Busy* - ElectricFlow is attempting to refresh the job status, but the resource is not responding or the UI cannot parse the response. Changing the value of 'Agent Host Name' to the IP address can sometimes resolve this issue.
Description	A plain text or HTML description for this object. If using HTML, you must surround your text with `<html> ... </html>` tags. The only HTML tags allowed in the text are: `<a> <b>   <div> <dl> <font> <i> <li> <ol> <p> <pre> <span> <style> <table> <tc> <td> <th> <tr> <ul>`.
Zone	The name of the zone where this resource is a member.
HTTPS & Host	The "Connection Type" you specified when this resource was created.

Column name / icon	Description
Step Load	Resource *load* is indicated by one of the following: 1 of unlimited - this notation indicates 1 step is using this resource and an unlimited number of steps can use this resource at the same time. If 5 steps are using this resource, you would see "5 of unlimited". 0 of 4 - this notation indicates that no steps are running on this resource and the step limit is set to 4. The bar indicates graphically how close you are to the step limit. **Note:** Use the Create/Edit Resource panels to define the number of steps that can run on a resource. Setting the Step Limit to "0" or leaving the field blank defaults to NO step limit.
Actions	Actions you can perform on the resource, including: **Copy**–Create a new resource by copying the this resource. **Delete**–Delete this resource. **Tear Down**–Remove the dynamic resource from a dynamic environment. **Track Changes** --Open the Change History for the resource.

Grid view

Two icons above the Filters pane:

- The first icon (on the left) is the default *Table view* icon.

- The second icon (on the right) displays the resource *Grid view*.
  Use the drop-down menus to filter the Grid view:

  ○ Grouping - Select the resource "grouping" you want to see—choose Pool, Job, Operating System, Platform, Proxy Agent, Version, or Zone.
  For example, if you have multiple resource pools defined and chose Pool, you will see groups labeled with your various pool names and a group (No Pool) for resources not included in a pool.

- Coloring - Select what you want to view in each group—choose Platform, Step Count/Limit, Status, Held Exclusive, Version, or Operating System to sort your group.
  Note: Colors are dynamically assigned per the view you select. Within a single view, the same color "square" implies similar information.

- Hovering your mouse over a grid "square" provides more detailed information about that resource.

Filters pane

Use the Filters pane to filter resources shown in either the Table or Grid view. The fields in the Filter pane correspond to columns in the Table view.

Enter Filter criteria as follows:

Actions / Field	Description
Save Filters	Click this link to save your filter criteria. A dialog box is displayed so you can name your filter. For easy, repeat access, filters are saved in a "saved filters" box above the link. When you select a saved filter name, the Filter pane fields populate automatically.
Reset	Use this link to clear all entries in the Filter pane.
Quick Search field	Enter any text for your search. For example, enter a host name. You do not need to enter a full name or text string - this field filters on a partial text entry, sometimes 2-3 characters are all you might need.
Status	The status for the agent machine.
Drop-down menu	Default is *both* enabled and disabled resources. Use the drop-down arrow to choose enabled or disabled only.
Pools field	List one or more pool names, separated by a space. (No spaces are allowed within a pool name). Pool names must be entered exactly - a shorten version of the pool name will not yield a successful result.
Hosts field	List one or more full host names as shown in the Table view "HTTPS & Host" column (each name separated by a space). Entering a partial name will not yield a successful result.
Step Limit drop-down menu	Choose the step limit corresponding to your desired search.
Proxy Agent drop-down menu	Select No if not searching for a proxy agent or Yes if you are trying to locate a proxy agent.

Actions / Field	Description
Filter button	Select this button after you complete the fields/selections to define your filter criteria.

New Resource panel

To define a new standard resource, enter information in the fields as follows:

Field	Description
Name	Enter a unique name for this resource. *Do not use* "spaces" in a resource name. This is the name used to select the resource for a job step—it need not be the same as the host name for the machine.
Description	A plain text or HTML description for this object. If using HTML, you must surround your text with `<html> ... </html>` tags. The only HTML tags allowed in the text are: `<a> <b>   <div> <dl> <font> <i> <li> <ol> <p> <pre> <span> <style> <table> <tc> <td> <th> <tr> <ul>`
Agent Host Name	Enter the domain name or IP address of the agent machine for this resource. This is the name all other machines in this agent/resource's zone will use to communicate with this agent host.
Agent Port Number	Enter the port number to use when connecting to the agent for the resource, Default port is 7800.
Default Workspace	Enter the workspace name or leave blank to use the local, default workspace. The workspace specification can be overridden at the project, procedure, or step level. If you specify a workspace name here, it will be used as the default for all job steps that run on this resource. See the Workspaces Help topic in the *ElectricFlow Help Guide* for more information.
Pool(s)	A space-separated list of arbitrary names indicating the pools associated with this resource. *Do not use* "spaces" in a pool name.

Field	Description
Host Type	Use the drop-down menu to select the host type: • **Concurrent** • **Registered** Depending on the license installed on the ElectricFlow server, this field may appear. • If the license on the server is a concurrent resource license, the host type defaults to **Concurrent** and this field does not appear. • If the license on the server is a registered host license, the host type defaults to **Registered** and this field does not appear. • If the license on the server is a mixed-mode license (concurrent resources and registered hosts), you must specify the host type when adding a resource.

Field	Description

Default Shell	The name of the shell program used to execute the step's commands on a resource. For example, using `sh` or `cmd /c`, the agent saves thecommand block to a temporary file with a `.cmd` extension and runs it: `sh foo.cmd` or `cmd /c foo.cmd`.
	
	 If you do not specify a shell on a step, at step run-time the server looks at the resource shell. If a resource shell is not set, the shell line used by the agent is platform dependent:
	   Windows: `cmd /q /c "{0}.cmd"`
	   UNIX: `sh -e "{0}.cmd"`
	
	 When you specify a shell (in the step or resource), and omit the `cmd-file` marker, the agent notices the omission and takes the correct action.
	 For example: a user specifies `sh -x`. The agent converts this to `sh -x "{0}.cmd"`.
	
	 Two alternate forms of shell syntax where ElectricFlow uses a "marker," `{0}`, as a placeholder for the command file argument:
	
	 • *<myShell>* `{0}` *<potential extra shell args>*
	 In this example, the command file is not meant to be the last argument in the final command line.
	 For example, `mysql -e "source {0}"`
	 This shell example runs the `mysql` command against this step's command containing `sql`.
	 • *<myShell>*`{0}`*<.file extension> <potential extra shell args>*
	 In this example, the shell requires the command file to end in an extension other than `.cmd`.
	 For example, `powershell "& '{0}.ps1'"`
	 This shell example runs Microsoft PowerShell against this step's command containing PowerShell commands.
	
	 Notes:
	
	 • When the agent parses the shell, it will parse the extension as everything after `{0}.` until it sees a space or non-alphanumeric character.
	 • If your script uses International characters (non-ascii), add the following block to the top of your `ec-perl` command block:
	   `use utf8;`
	   `ElectricCommander::initEncodings`

Field	Description
Step Limit	The maximum number of steps that can execute simultaneously on this resource—a step limit applies to a particular resource only, not to its underlying host. For example, if you define two resources, resource1 with a step limit of 5 and resource2 with a step limit of 1, both specifying the same host machine, it is possible for a total of 6 steps to execute simultaneously on the underlying host. The Resource Details panel displays this information. **Note:** Setting the Step Limit to "0" or leaving the field blank defaults to NO step limit.
Artifact Cache Directory	The directory on this resource's agent host from which artifact versions are retrieved and made available to job steps. Enter an absolute path to the resource containing this cache directory.
Zone	The name of the zone where this resource is or will be a member—a zone is a top-level network containing one or more mutually accessible resources.
Repository Names	A "new-line" delimited list of repository names for this resource, if needed. When a step attempts to retrieve artifact versions from an ElectricFlow repository, it queries repositories specified here. If no repositories are specified, it will "fallback" to the default repository.
Connection Type	Use the drop-down menu to select your Connection Type: - **HTTP** - choose this option if you are not using SSL and the agent does not need to be "trusted". - **HTTPS** - choose this option if you are using SSL, but this agent does not need to be "trusted". - **Trusted HTTPS** - choose this option if you are using SSL and this agent must be "trusted". A trusted agent is "certificate verified"—the agent verifies the server or "upstream" agent's certificate. **Note:** For information about the certificate used for trusted agents, see the ElectricFlow-Installed Tools, eccert section, Help topic. Agents can be either *trusted* or *untrusted*: - *trusted* - the ElectricFlow server verifies the agent's identity using SSL certificate verification. - *untrusted* - the ElectricFlow server does not verify agent identity. Potentially, an untrusted agent is a security risk.

Field	Description
Enabled	Select this box to enable this resource. When this box is checked, the resource is enabled, which means job steps can be assigned to it. If a job step requests a pool containing this resource, the step executes on a resource in that pool. If disabled, and this is the only resource that satisfies a particular job step, the step's execution is delayed until the resource is re-enabled. If a resource is disabled while job steps are running on it, the running steps continue to completion but no new steps are assigned to that resource.

Click **OK** to save your settings and see your new resource listed in the table.

New Proxy Resource panel

These are the definitions of a proxy agent and proxy target:

- Proxy *agent*–This is an agent on a supported Linux or Windows platform, used to proxy commands to an otherwise unsupported platform.
- Proxy *target* –This is a machine on an unsupported platform that can run commands via an SSH server.

To define a new proxy resource,enter information in the fields as follows:

Field	Description
General	
Name	Enter a unique name for this resource. ***Do not use*** spaces in a resource name. This is the name used to select the resource for a job step; it does not need to be the same as the host name for the machine.
Description	A plain text or HTML description for this object. If using HTML, you must surround your text with `<html> ... </html>` tags. The only HTML tags allowed in the text are: `<a> <b>   <div> <dl> <font> <i> <li> <ol> <p> <pre> <span> <style> <table> <tc> <td> <th> <tr> <ul>`
Proxy Agent Host Name	Enter the domain name or IP address of the proxy agent machine corresponding to this resource.
Proxy Agent Port Number	Enter the port number to use when connecting to the agent for the resource.

Field	Description
Default Workspace	Enter the workspace name for leave blank to use the local, default workspace. If you specify a workspace here, it will be used as the default for all job steps that run on this resource. See the Workspaces Help topic for more information.
Pool(s)	Enter a space-separated list of arbitrary names, indicating the pools associated with this resource. ***Do not use*** "spaces" in a pool name.
Host Type	Use the drop-down menu to select the host type: • **Concurrent** • **Registered** Depending on the license installed on the ElectricFlow server, this field may appear. • If the license on the server is a concurrent resource license, the host type defaults to **Concurrent** and this field does not appear. • If the license on the server is a registered host license, the host type defaults to **Registered** and this field does not appear. • If the license on the server is a mixed-mode license (concurrent resources and registered hosts), you must specify the host type when adding a resource.
Step Limit	Specify the maximum number of steps that can execute simultaneously on this resource—a step limit applies to a particular resource only, not to its underlying host. For example, if you define two resources, `resource1` with a step limit of 5 and `resource2` with a step limit of 1, both specifying the same host machine, it is possible for a total of 6 steps to execute simultaneously on the underlying host.
Zone	The name of the zone where this resource will be a member.

Field	Description
Connection Type	Use the drop-down menu to select your Connection Type: • **HTTP** - choose this option if you are not using SSL and the agent does not need to be "trusted". • **HTTPS** - choose this option if you are using SSL, but this agent does not need to be "trusted". • **Trusted HTTPS** - choose this option if you are using SSL and this agent must be "trusted". A trusted agent is "certificate verified"—the agent verifies the server or "upstream" agent's certificate. **Note:** For information about the certificate used for trusted agents, see the ElectricFlow-Installed Tools, eccert section, Help topic. Agents can be either *trusted* or *untrusted*: • *trusted* –The ElectricFlow server verifies the agent's identity using SSL certificate verification. • *untrusted* –The ElectricFlow server does not verify agent identity. Potentially, an untrusted agent is a security risk.
Enabled	Select this box to enable this resource. When this box is checked, the resource is enabled, which means job steps will be assigned to it. If a job step requests a pool containing this resource, the step executes on a resource in that pool. If disabled, and this is the only resource that satisfies a particular job step, the step's execution is delayed until the resource is re-enabled. If a resource is disabled while job steps are running on it, the running steps continue to completion but no new steps are assigned to that resource.
Proxy Target	
Proxy Target Host Name	Enter the domain name or IP address of the proxy target machine corresponding to this resource.
Proxy Target Port Number	Enter the port number to use when connecting to the proxy target host or leave blank to use the default. The default port is 22, the SSH server port.

Field	Description

Proxy Target Default Shell	The name of the shell program used to execute commands on this [the proxy target] resource—may be overridden at the step level.
	
	This shell will be used to execute the step's commands on a resource. For example, using `sh` or `cmd /c`, the agent saves the command block to a temporary file with a `.cmd` extension and runs it: `sh foo.cmd` or `cmd /c foo.cmd`.
	
	If you do not specify a shell on a step, at step run-time the server looks at the resource shell. If a resource shell is not set, the shell line used by the agent is platform dependent:
	Windows: `cmd /q /c "{0}.cmd"`
	UNIX: `sh -e "{0}.cmd"`
	
	When you specify a shell (in the step or resource), and omit the `cmd-file` marker, the agent notices the omission and takes the correct action.
	For example: a user specifies `sh -x`. The agent converts this to `sh -x "{0}.cmd"`.
	
	Two alternate forms of shell syntax where ElectricFlow uses a "marker," `{0}`, as a placeholder for the command file argument:
	
	• *<myShell>* `{0}` *<potential extra shell args>*
	In this example, the command file is not meant to be the last argument in the final command line.
	For example, `mysql -e "source {0}"`
	This shell example runs the `mysql` command against this step's command containing `sql`.
	• *<myShell>*`{0}`*<.file extension> <potential extra shell args>*
	In this example, the shell requires the command file to end in an extension other than `.cmd`.
	For example, `powershell "& '{0}.ps1'"`
	This shell example runs Microsoft PowerShell against this step's command containing PowerShell commands.
	
	Notes:
	• When the agent parses the shell, it will parse the extension as everything after `{0}.` until it sees a space or non-alphanumeric character.
	• If your script uses International characters (non-ascii), add the following block to the top of your `ec-perl` command block:
	`use utf8;`
	`ElectricCommander::initEncodings`

Field	Description
Proxy Customizations	This is proxy-specific customization data. Default is "none". See the "ElectricFlow-Installed Tools" Help topic (ecproxy section) for more information.

Click **OK** to save your settings.

Edit Resource panel

All of the fields on this panel are the same as those on the New Resource panel:

- All information you previously provided to create this resource is filled-in for you.

- You can change any information already supplied.

- You can add information in any blank fields.

Click **OK** to save your modifications.

> **IMPORTANT:** If you want to change the Connection Type, using the UI by itself is insufficient. You must also use the `ecconfigure` utility to change the protocol. Run: `ecconfigure --agentProtocol [http|https]`

Edit Proxy Resource panel

All of the fields on this panel are the same as those on the New Proxy Resource panel:

- All information you previously provided to create this resource is filled-in for you.

- You can change any information already supplied.

- You can add information in any blank fields.

Click **OK** to save your modifications.

Resource Details panel

This panel displays how this resource is configured with the ElectricFlow server. Some of the information supplied is linked to its source. For example, the zone name for this resource is a link to its Zone Details panel.

- The name of the resource is shown below the panel title.

- The resource description is shown under the resource name.

- Links at the top of the panel:

  ○ Use the **View Usage** link to go to the Job Step Search Results page.

  ○ Use the **Edit** link to modify the resource specifications.

  ○ Use the **Access Control** link [at the top of the panel] to specify or view access privileges for this resource.

- The tabs:

  ○ General - by default, the panel opens to display the "general" resource configuration.

  ○ Properties - select this tab to add properties to this resource or see existing resource properties if already configured.

  Custom Resource Properties
  You can define custom properties for any ElectricFlow object. For example, if configuration information varies from resource to resource, use custom properties to store this information and then reference it from procedure steps where it is needed.
  For example, if you have a pool of test machines with test hardware in a different location on each machine, you could define a property named "testLocation" on each resource, then pass this property to procedure steps using a reference such as `$[/myResource/testLocation]`.

Switching a non-trusted agent to trusted

If you have upgraded to ElectricCommander 4.2 or later, none of your existing agents were converted to "trusted" during the upgrade process. By default, the *local* agent is not trusted during a new or upgrade installation.

After an upgrade, if you want to use a trusted configuration, any *pre-existing* agent/host machines must be manually switched to "trusted".

Manually switching a non-trusted agent to trusted status

Perform the following steps to change the agent status to trusted in your environment and in the customer's site.

1. Enter `ectool --server <COMMANDER_SERVER_IP> login admin` to log into the server and save the session ID.

2. Enter `eccert initCA` to initialize the server Certificate Authority (CA).

   A new CA key and certificate are created.

3. Enter `eccert --server <COMMANDER_SERVER_IP> initAgent --remote --force` to install the agent with a self-sgned certificate that needs to be overwritten.

4. Restart the agent.

   If you do not restart the agent, i t tries to use a previously cached certificate if one exists. The old certificate is invalid because a new one was just created.

5. In the ElectricFlow UI, ping the agent.

For information about the ElectricFlow Certificate Authority (CA) and the certificates configured in ElectricFlow Server and ElectricFlow Agent installations, see the "ElectricFlow Installed Tools" section in the *ElectricFlow User Guide* or the *ElectricFlow Help Guide*.

Install or Upgrade Remote Agents

Select this button,   , to install or upgrade host machines you want to use as agent machines for your ElectricFlow resources. A dialog box opens where you enter information about the hosts to install or upgrade.

- If no hosts are selected in the Resources Table view, you will be installing host names you enter.

- If host names are listed already in the Resources Table view, selected one or more to perform an upgrade operation.

Notes:

- The dialog screens you see for an Install operation will be somewhat different from those for an Upgrade operation, depending on the options you choose.

- You can install or upgrade Linux, Solaris, Solaris x86, HP-UX, or MacOS hosts.

- When you install the agent software on a Solaris host, install it in a directory path that has less than 70 characters. .

Prerequisites:

- You must have an artifact repository server installed.

- The target machines must be running the SSH daemon.

- The user you select must be set up for passwordless *sudo* privileges.
  For example, in the `/etc/sudoers` file, you must add "`<username> ALL=(ALL) NOPASSWD:ALL`"

> **IMPORTANT:** If the EC-AgentManagement plugin is *not* installed, the remote install/upgrade option will not be available and you cannot install/upgrade agents remotely from the automation platform user interface. During a new ElectricFlow installation, this plugin is installed automatically.

- For each remote agent machine you want to upgrade, make sure PasswordAuthentication=yes in `/etc/ssh/sshd_config`.
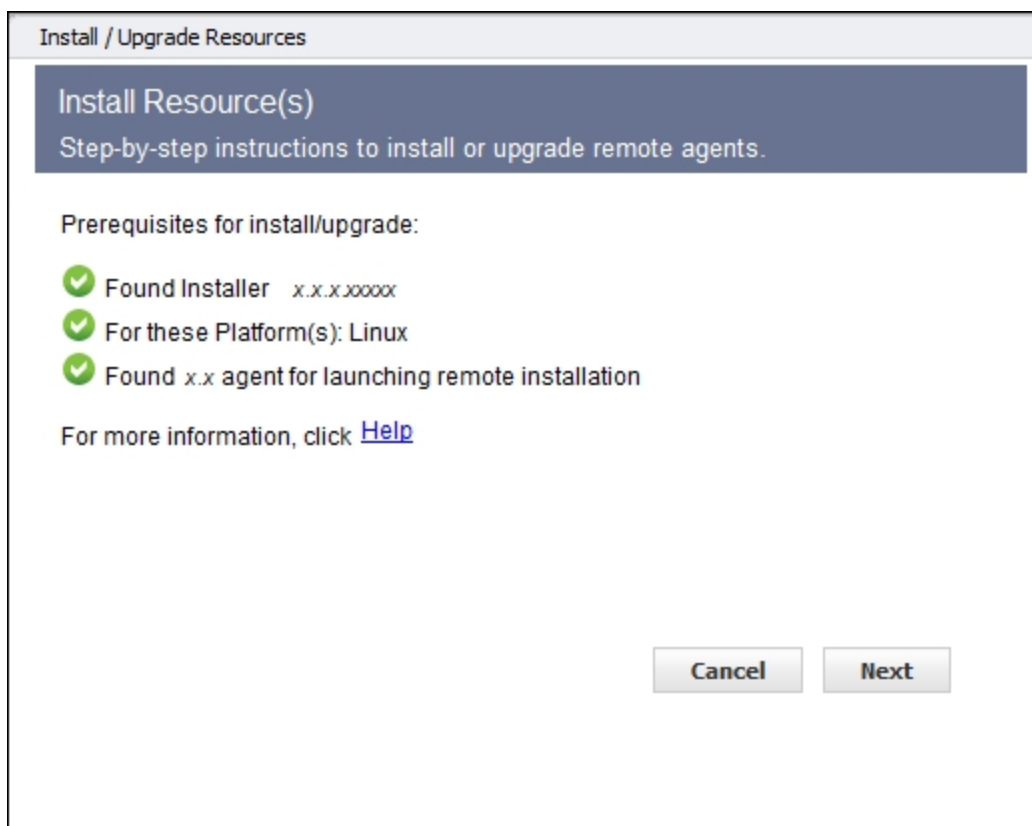 Example:

  ```
  # To disable tunneled clear text passwords, change to no here!

  PasswordAuthentication yes
  ```

  PasswordAuthentication=no is the default on SUSE platforms, so you must edit `/etc/ssh/sshd_config`. Restart the sshd service after changing the value.

- On Unix, SSH has the following additional prerequisite:

  ○ The user account on the target machine must have password-less sudo configured for running the installer with root privileges.

Using the Install or Upgrade Remote Agents Dialog Box

The ElectricFlow server runs several verification checks before you begin an Install/Upgrade operation, and when you see the following screen with all green "check mark" icons, you can proceed.
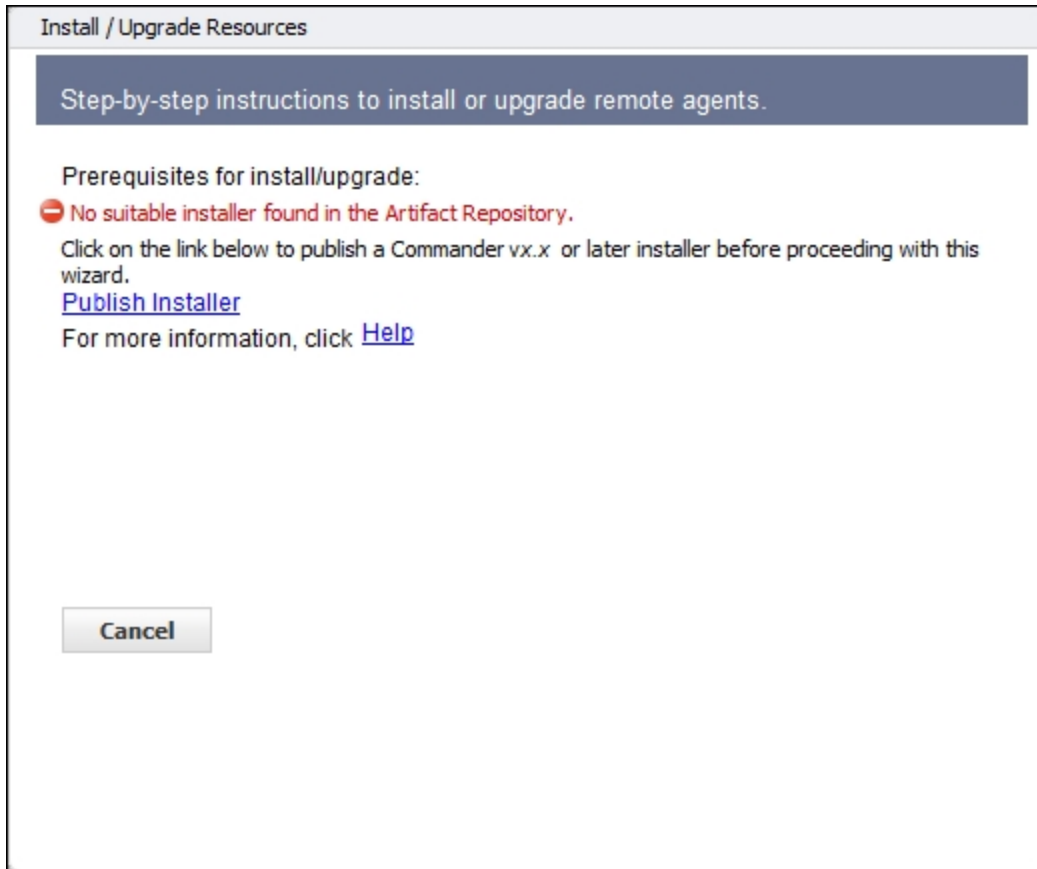
Note: Depending on your selections, you will see variations in some to the following screen examples.

Click **Next** to continue.

However, if the plugin is installed but an ElectricFlow 4.2 or later installer is not found in the artifact repository, you will see an error screen similar to the example below.

Click the **Publish Installer** link.

Install / Upgrade Resources

Step-by-step instructions to install or upgrade remote agents.

Prerequisites for install/upgrade:
🚫 No suitable installer found in the Artifact Repository.
Click on the link below to publish a Commander vx.x or later installer before proceeding with this wizard.
Publish Installer
For more information, click Help

Cancel

After clicking the **Publish Installer** link, the Run Procedure – Publish Installer page opens.

Enter information in the fields as follows:

Parameters

fromDir–Enter the path to the directory containing the installer on the ElectricFlow server machine. For example, `/var/tmp` for Linux.

platform–Use the drop-down menu to make a selection

repository–Use `default` to use the repository installed during the ElectricFlow installation, or type-over `default` and enter a different repository name

version–Enter the build version for your ElectricFlow install, for example, "`5.0.0.56390`". Your build version can be obtained from the name of the ElectricFlow installer you downloaded from the Electric Cloud FTP site.

Advanced

(Not required to complete the Publish Installer run procedure)

When the Publish Installer procedure runs, you can see the job status on the Job Details page.

For verification:

Go to the Artifacts page > select `com.electriccloud:installer`, which displays the Artifact Details page. This page displays all of your published installers.

Return to the Resources page and begin again

Assuming you now have all green "check mark" icons on the first dialog screen, and you clicked **Next**, the following dialog screen is displayed.
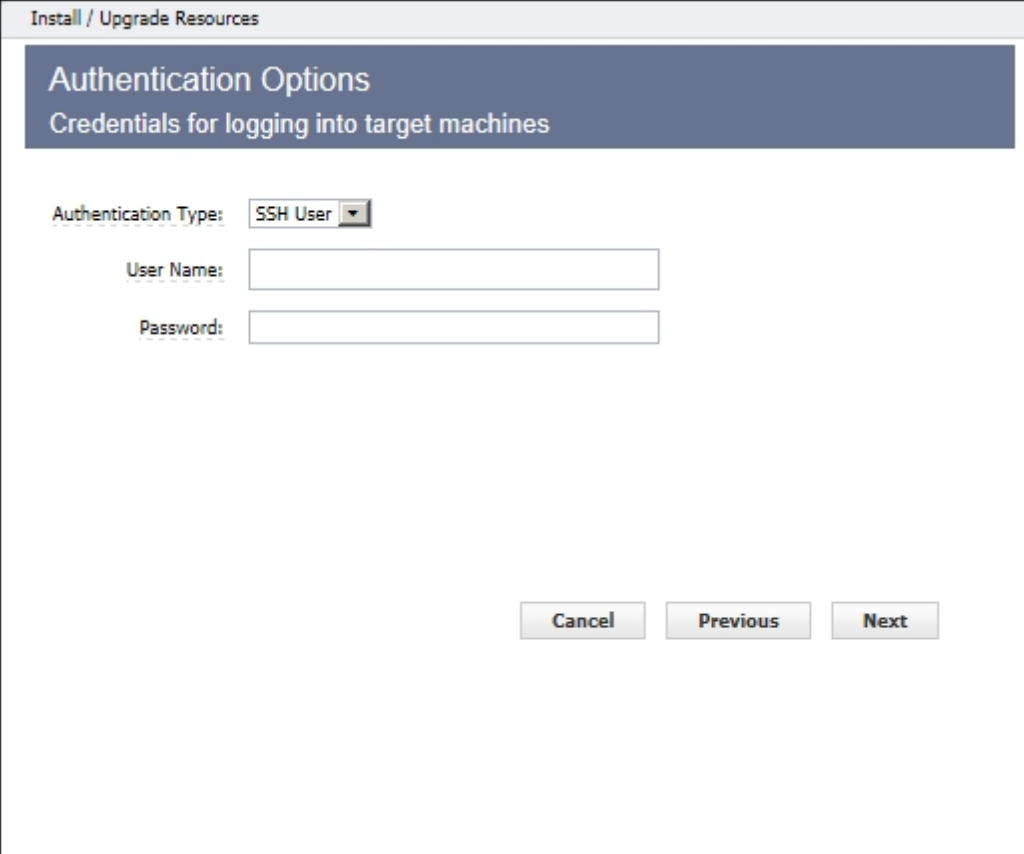

Enter information in the fields as follows:

- Zone–If you have not defined additional zones, the `default` zone is used and you will not see this field. If you have multiple zones defined already, use the drop-down menu to choose the zone where you are installing or upgrading agents. *You can install or upgrade agents to only one zone at a time.* A functioning gateway must exist before an agent can be installed into the non-default zone. So installing the first agent into a zone must be done manually.

- Install to Host–(required) Enter one or more host names or IP addresses in a space-separated list. Individual host names *cannot* contain spaces. If this is an upgrade operation, host names or IP addresses are pre-populated in this field from the resources you selected for upgrade on the Resources page - Table view, first column.

- Name Templates—Use the drop-down menu to choose a simple template for setting the names of newly created resources.
- Template—You can edit this field only if you selected Custom in the Name Template drop-down menu. This field undergoes property expansion in a global context and is scanned for special tokens {name} and {counter}.
- Driving Resource—This resource performs all actions for installing or upgrading a target host on behalf of the server.

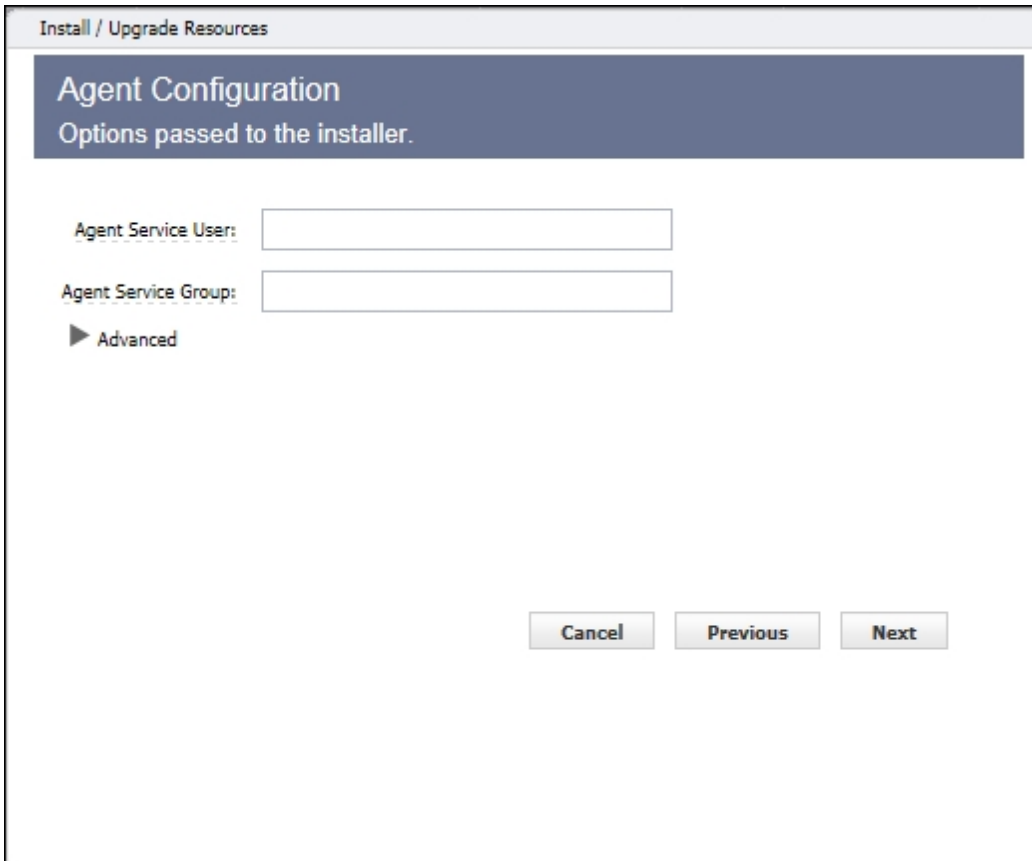Click **Next** to continue to the next dialog screen.

Enter information in the fields as follows:

Authentication Type - use the drop-down menu to choose SSH User, SSH Key, or WMI:

- If SSH User:
  - User Name - (required) Enter a user name.
  - Password - (required) Enter a password for the user name.
- If SSH Key:
  - User Name - (required) Enter a user name.

- ○ Public Key Path - (required) The path to the SSH public key file.

- ○ Private Key Path - (required) The path to the SSH private key file.

- ○ Passphrase - (optional) The passphrase for unlocking the private key file.

- • If WMI:

  - ○ No additional information is needed

Click **Next** to continue to the next dialog screen.

Note: You will not see this screen if you are *upgrading* hosts.

For installing hosts, enter information in the fields as follows:

- • Agent Service User - (required) the user the ElectricFlow agent "runs as".

- • Agent Service Group - (required) the group the ElectricFlow agent "runs as".

Selecting "Advanced" is optional - Select this option to define non-default values.

- • If you did not select Advanced, click **Next** to continue (and skip the next dialog screen example).

- • If you selected Advanced, see the next dialog screen example.

(Optional) **Advanced** options:

- Agent Port - Specify the listener port for the agent.

- Install Directory - Specify the path to the install directory.

- Data Directory - Specify the path to the directory where your modified ElectricFlow files are stored (configuration and log files).

- Trusted Agent - Select this check box and all agent machines being installed or upgraded will be "trusted". For more information, see Switching a non-trusted agent to trusted on page 31.

Click **Next** to continue to the summary dialog.

Your summary dialog will be similar to the following example, but it will contain the values you specified.

Note: If you are installing or upgrading more than 5 hosts, you will see a quantity number and NOT a space-separated. list of host names.

Click **Finish** to start the install or upgrade and the Job Details page is displayed.

When Install/Upgrade is complete, you can return to the Resources page to see your newly installed or upgraded hosts listed in the Table or Grid view.

To verify a resource version, click a resource name (in the Resources page Table view) to open the Resource Details panel for that resource.

Setting Up Gateways and Zones

ElectricFlow provides the capability of establishing security zones for agents and repository servers.

What is a zone?

A zone consists of a collection of resources that can directly communicate with each other. Within a large corporation, a zone may encapsulate a physical site, and communication between any two sites occurs through firewalls.
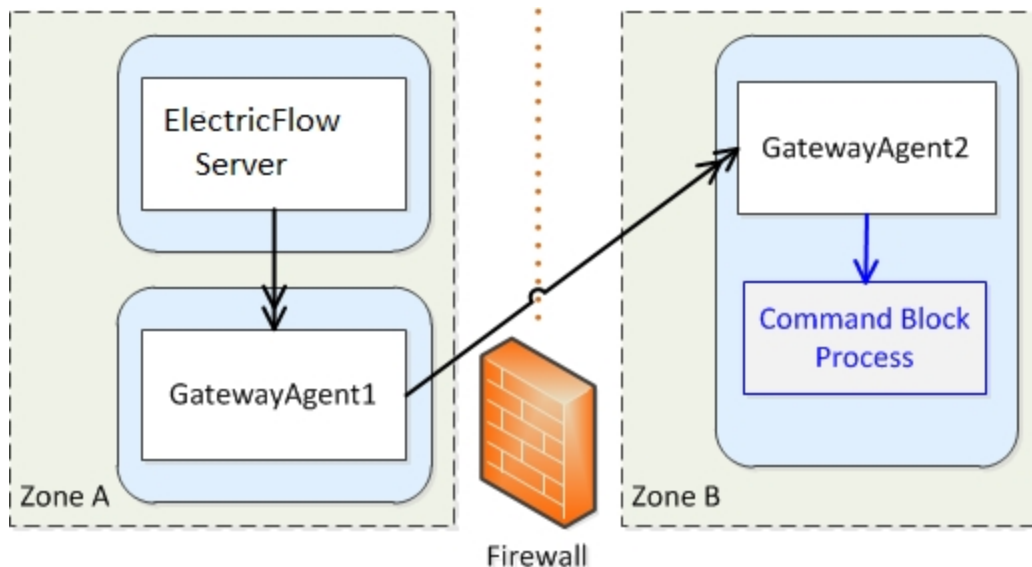
What is a gateway?

The details of this connection information are recorded in a gateway object in ElectricFlow. Using the example in Cross-zone communication on page 40 as a reference, a gateway object consists of the following information:

- Name of a gateway resource in one zone (GatewayAgent1)

- Name of a gateway resource in another zone (GatewayAgent2)

- Host/port GatewayAgent2 uses to communicate with GatewayAgent1 (for example, the firewall IP address in ZoneB)

- Host/port GatewayAgent1 uses to communicate with GatewayAgent2 (for example, the firewall IP address in ZoneA)

Cross-zone communication

The following figure shows an example gateway and zone configuration with two zones and three machines.

Cross-zone communication is managed by proxying requests through specially marked resources called "gateway resources". In the previous example, if the ElectricFlow server wants to run a command block process step on an agent in Zone B, it issues its request through GatewayAgent1. The request includes extra metadata that instructs GatewayAgent1 to forward the request to the target agent. The firewall is configured to allow

connections from GatewayAgent1 to GatewayAgent2. It is also configured to allow connections from GatewayAgent2 to GatewayAgent1. This is necessary because API communication (CLI commands and the step completion message) is sent from GatewayAgent2 on its own outbound connection to the server (through GatewayAgent1).

Because the firewall separates two private networks, there's no guarantee that IP address ranges in one network do not overlap with those of the other. When either gateway agent wants to connect to the other, the gateway agent uses an IP address to the firewall that is valid for its side of the firewall.

Support for gateways

The previous example shows two zones for simplicity, but ElectricFlow supports an unlimited number of zones, including chained zones. For example, if a third zone called Zone C is only accessible from Zone B via GatewayAgent3 (in Zone B) and GatewayAgent4 (in Zone C), the server could issue a request to GatewayAgent1, which forwards the request to GatewayAgent2, which forwards it to GatewayAgent3, which forwards it to GatewayAgent4.

Also, for resiliency, ElectricFlow supports having multiple gateway agents between two zones. If one gateway agent goes down, the system will detect the failure and route all requests through the other gateway agent.

Configuring Zones

This page displays zones currently available to ElectricFlow and provides other zone operations—create,edit, delete, and so on.

- A zone is a way to partition a collection of agents to secure them from use by other groups.
  For example, you might choose to create a developers zone, a production zone, and a test zone— agents in one zone cannot directly communicate with agents in another zone.

- A *default* zone is created during the ElectricFlow installation.
  The server implicitly belongs to the default zone, which means all agents in this zone can communicate with the server directly (without the use of a gateway).

- Each zone can have one or more "gateway agents", which you define. Gateway agents are used for communication from one zone to another zone. For more information, see the Gateways Help topic.

- Every agent, and all resources defined on that agent, can belong to one zone only.

- Within a zone, agents can be either *trusted* or *untrusted*.

  - trusted - the ElectricFlow server verifies the agent's identity using SSL certificate verification.

  - untrusted - the ElectricFlow server does not verify agent identity. Potentially, an untrusted agent is a security risk.

Links and actions at the top of the table

- To create a new zone, click the **Create Zone** link.

- The "star" icon allows you to save this zone information to your Home page.

Column descriptions

Column Name	Description / Actions
Name	The name supplied when this zone was created. Click on a Zone Name to see the Zone Details panel for that zone.
Descriptions	A plain text or HTML description for this object. If using HTML, you must surround your text with `<html> ... </html>` tags. The only HTML tags allowed in the text are: `<a> <b>   <div> <dl> <font> <i> <li> <ol> <p> <pre> <span> <style> <table> <tc> <td> <th> <tr> <ul>`
Actions	**Delete** - Use this link to delete the zone on the same row. **Note:** Deleting a zone does not delete resources in the zone. All agents (and their respective resources) move to the default zone if their current zone is deleted. The *default* zone *cannot* be deleted.

Zone Details panel

This panel displays the zone name and description for the zone you selected.

Links and actions at the top of the table

- **Resources**–Use this link to go to the Resources page.

- **Edit**–Click this link to display the Edit Zone panel.
  On the Edit Zone panel, you can change the zone name ,or you can add or change the zone Description.
  Click **OK**after making any changes.

- **Access Control** - Use this link to go to the Access Control page for this zone.

  ○ Current access privileges are displayed, if any.

  ○ Add the access control privileges you need for this zone.

Select the Properties tab to view any properties created for this zone, or use the "create" property links to create properties for this zone.

Creating a new zone

Enter information in the fields as follows:

Field Name	Description
Name	Enter a name of your choice for this zone. The name must be unique among other zone names.
Description	A plain text or HTML description for this object. If using HTML, you must surround your text with `<html> ... </html>` tags. The only HTML tags allowed in the text are: `<a> <b>   <div> <dl> <font> <i> <li> <ol> <p> <pre> <span> <style> <table> <tc> <td> <th> <tr> <ul>`.

Click **OK** to see your new zone displayed in the table.

To add resources to this zone, go to the Resources page.

Access Control notes

A zone inherits privileges from the ZonesAndGateways ACL. See the "Access Control" ("Server Objects" section) Help topic for more information.

Resource and Resource Pool continue to inherit from Resources privileges. To create a resource, you must have modify privileges on Resources (this has not changed) and you must have modify privileges on the zone.

In addition, to move a resource from one zone to another, you must have modify privileges on both zones and the resource you want to move.