

Important -- Read the first two pages before you begin installing

Overview

- With the ExtendSim Cloud platform, a company's employees and/or clients can remotely configure, run, and obtain results from ExtendSim simulations in the cloud, without installing ExtendSim on their local devices.
- Once a company has set up the ExtendSim Cloud platform, its internal or external end user "clients" will use a customized interface (browser GUI or standalone app) on their local devices to input data into ExtendSim models that are located remotely on the company's servers. The end user clients can then run the models and receive results on their local devices.
- ExtendSim Cloud uses a License Manager (*rlm.exe*) to control the number of instances of ExtendSim that are running. The License Manager can be installed on either a separate License Server or on the same device being used as the Cloud Server. The number of running instances is limited by the ordering document's maximum number of concurrent instances and the number of cores on the Cloud Server.

Client/Server Architecture

The ExtendSim Cloud product utilizes a client/server configuration that:

- Allows ExtendSim simulations to be run on the company's virtual or physical Cloud Server, over a local or wide area network such as the internet, from the client's local device.
- Has a Cloud Services Manager that runs as a service to control and route all interactions between the clients' local devices and ExtendSim running on a Cloud Server.

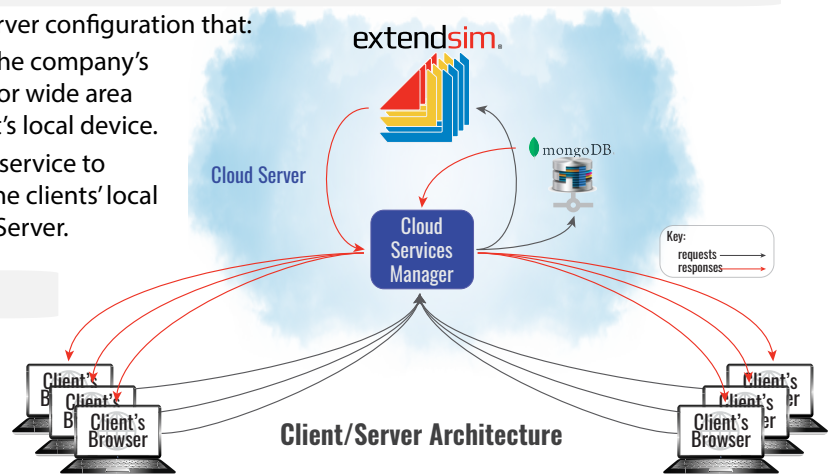
ExtendSim Cloud Framework

The Client frontend communicates directly with the *Cloud Services Manager (CSM)* via the ExtendSim *http Cloud API*. The CSM processes client requests to launch ExtendSim instances and run scenarios by opening, configuring, and running copies of reference models that have been

stored on the server. The CSM then automatically stores run results on the server as JSON files that can be piped back to the frontend upon request. Importantly, the CSM can move very large data sets into and out of ExtendSim models and back and forth between Server and Client. The ExtendSim Cloud framework gets installed on a Cloud Server and consists of:

1. A backend to the ExtendSim Cloud framework consisting of:
 - a. Developed in *node.js*, the CSM is a continuously running service that always responds to requests from Client frontends. The list of APIs for communicating with the CSM is described in the *ExtendSim Cloud User Guide*.
 - b. The maximum number of ExtendSim instances allowed to run in parallel on the server is limited by how many have been purchased. When the number of jobs to run models exceeds the number of available ExtendSim instances, the CSM queues these jobs on a FIFO basis.
 - c. *MongoDB* is used as a *data repository*, storing client information such as user groups, credentials, scenarios, etc.
2. A frontend that is a custom application the company modifies or creates to provide the required client GUI. It can be developed in any *http* compatible language, e.g., Python, JavaScript, C#. Alternatively, ExtendSim Cloud ships with a general-purpose browser-based *Scenario Manager*, but it typically serves as a template for how to communicate with the CSM.

End-user Clients are organized into groups with authenticated login credentials so that access can be restricted to specified models. Additional security during user sessions is provided by using *JWT Tokens*.



Steps in the ExtendSim Cloud Installation and Activation Process

| Step # | Description | Page # |
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| 1 | Install and activate the License Manager on the License Server | 4 |
| 2 | Install and activate ExtendSim Cloud and the backend components on one or more Cloud Servers ... | 7 |
| 3 | Launch the Cloud Services Manager | 8 |
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Requirements

License Server (where you install the License Manager - RLM)

- Ports that must be unblocked. For details, see *Open Communication Channels (Ports)* on page 12.
 - 5054 (a web server port) so you can use a browser to communicate locally with the License Manager.
 - Two ports (5053 and the ISV port) must be open on each Cloud Server for inbound access. The default ISV port is 51006; we strongly suggest you do not change it.
- Operating system: A 64-bit version of Windows, such as 11, 10, or Server.
- Disk space: 100 MB.
- The License Server can be a physical or virtual server. If virtual, the MAC/Ethernet address must be static.
- A browser to communicate with the License Manager locally (over an intranet, not the internet) for activation.

Cloud Servers (where you install ExtendSim Cloud)

- Ports that must be unblocked. For details, see *Open Communication Channels (Ports)* on page 12.
 - Two ports (5053 and the ISV port) must be open on each Cloud Server for outbound access. The default ISV port is 51006; we strongly suggest you do not change it.
 - A contiguous range of ports, open for inbound access, such that each instance of ExtendSim can be assigned a separate port number. The range is determined by setting a default base port number in a configuration file; the default base number for the contiguous range is 3750.
 - A Cloud Services Manager port that is open for inbound access. The default port is 3501; it is set in the configuration file.
 - A Database port for communications between the Cloud Services Manager and MongoDB. The default port is 27017.
- Operating system: A 64-bit version of Windows, such as 11, 10, or Server.
- The Cloud Server can be physical or virtual. If virtual, the MAC/Ethernet address must be static.
- Each Cloud Server must be able to communicate with the the License Server's License Manager over a local or wide area network.
- Processor: minimum 1GHz. Memory: 2GB RAM Disk space: 500 MB. Cores: 4 minimum.

Programming capability to create a customized client frontend app and a system for authenticating users.

This can be done using any *http* compatible language, e.g., Python, JavaScript, C# that is capable of properly using the Cloud Services Manager API functions for communication.

Annual Subscription payment so the license continues functioning.

Restrictions

- **The license stops working if the Maintenance & Support Subscription is not renewed within 30 days of the renewal date.**
- The ExtendSim Cloud product does not support model building, it only allows models to be configured and run.
- It is strongly suggested that separate License Servers be used for each ExtendSim product that requires a License Manager.

Included in the ExtendSim Cloud Product Package

The ExtendSim Cloud package contains installers for the License Manager and for the backend applications, a file for creating and configuring user groups, and a template for developing a frontend app. Included in the package:

Activation Key which is specific for:

- Your company.
- The maximum number of concurrent instances of ExtendSim ordered.
- The annual subscription renewal date for your ExtendSim Cloud license.

Two installers that must be executed:

- **ExtendSimServerLicenseManager.exe**
 - Installs the License Manager (rlm.exe) on the License Server and starts the service (*ExtendSimLicServer*) running.
 - The License Manager must be activated using the Activation Key.
 - Do not install the License Manager on a Server that already has an RLM License Manager.
- **ExtendSimCloud.exe** • installs 3 applications and several files on a Cloud Server at these locations:
 - Program Files/**MongoDB**
 - Program Files/**nodejs**
 - Program Files/**ExtendSimCloud**, a folder that contains:
 - ExtendSim.exe and ancillary files.
 - **Client Files** folder, which contains the *Cloud Scenario Manager.html*, a file you can customize as a default frontend app or use to test product functionality on Cloud Servers.
 - **Server Files** folder, which contains the files that need to be configured to define ports, models, model locations, users, user groups, and permissions.
 - Documents/**ExtendSimCloud** folder (or wherever user-modifiable documents are installed):
 - Documentation:
 - These instructions
 - ExtendSim Cloud User Guide
 - ExtendSim Cloud Technical Reference
 - Cloud License Agreement
 - **ExtendSim Reference Models** • An empty folder where your reference models can go.
 - **ExtendSim Scenario Folders** • An empty folder that will store folders to contain the scenario models generated when ExtendSim runs.
 - Other folders that contain standard ExtendSim libraries, include files, and so forth.

License Manager Installation & Activation Instructions

The License Manager is installed on a License Server, runs as a service, and controls the number of concurrently running instances of ExtendSim by monitoring requests transmitted through TCP/IP ports.

Notes:

1. Do not install more than one ExtendSim License Manager on the same License Server.
2. If you have other ExtendSim products that use an ExtendSim License Manager, it is strongly recommended that you install the License Manager for each product on a different License Server. If you must use one server's License Manager to control multiple ExtendSim products, contact Sales.ExtendSim@Andritz.com for instructions.
3. If you have multiple ExtendSim Cloud licenses (that is, multiple Activation Keys for the ExtendSim Cloud product), each license must be managed by its own License Manager, which is installed on its own License Server.
4. If Reprise License Manager (RLM) is already running on the License Server, see the special instructions in the *ExtendSim Cloud User Guide*.
5. Do not install new License Manager files over a previous installation without first stopping the service and uninstalling the old License Manager.

Step 1a • Install License Manager on the License Server

1. If possible, install the License Manager software on the License Server before installing ExtendSim on Cloud Servers.
2. Use the License Manager installer (*ExtendSimServerLicenseManager.exe*) and follow its instructions to install the License Manager files on a Server. You may need to install with elevated (administrative) privileges.
3. By default the installer creates a folder named *ExtendSimFloatingLicenseServer* that is placed at the root of the Server's C drive (C:\ExtendSimFloatingLicenseServer).
 - The folder can be installed on a drive other than the C drive, but it **must** be installed at the root of the drive and it **must** be named *ExtendSimFloatingLicenseServer*.
 - This folder is where the license file (*extendsim.lic*) and diagnostic logs and reports will be stored.
4. After installation, the License Manager (*RLM.exe*) will silently run in the background as a Service named *ExtendSimLicServer*.
5. Before proceeding, we suggest you verify that *ExtendSimLicServer* is running as a Service.



Common errors when installing the License Manager

- Installing on a virtual machine (VM) that uses dynamic MAC/Ethernet addresses. Some hardware virtualization products, such as Microsoft's Hyper-V, create VMs that, by default, have dynamic Mac/Ethernet addresses. For the License Manager to continue working on a virtual server after restarts, the server must use a static Mac/Ethernet address. If your server uses dynamic MAC/Ethernet addresses, you must change the settings in the VM's Manager so that the server uses a static address.
- Not installing the License Manager at the root of the drive or changing the name of the folder from the default name.
- Installing the new License Manager files over a previous installation without first stopping the service and uninstalling; see the *ExtendSim Cloud User Guide*.
- Installing on a Server that is already running the Reprise License Manager (RLM). If RLM is already running on the Server you wish to install the ExtendSim License Manager on, see the *ExtendSim Cloud User Guide*.

Step 1b • Activate the License Manager

You will communicate with the License Manager locally, on your network, using a browser and an embedded web server.

1. Open a browser.
 - If you open the browser on whichever Server you've installed the License Manager on, enter **localhost:5054** in the browser's address line and press Enter. (If your browser inserts *https://* in the address line, remove that text.)
 - If you open the browser on another device:
 - It must be on the same network as the device where you installed the License Manager.
 - Enter **servername:5054** in the browser's address line and press Enter. (Be sure *servername* is the name of the Server where the License Manager is installed and the text in the address line does not include *https://*.)
 - This takes you to the Reprise License Server Administration (RLSA) window.
2. From the commands on the left side of the RLSA window:
 - Select the **Activate License** command.
3. In the License Activation window that opens:
 - Click the button: **BEGIN License Activation**.
 - Then follow the five License Activation steps (steps 1-5) as described below.

4. License Activation (Step 1 of 5)

- Don't make any changes to ISV activation website: *www.hostedactivation.com*. →
- Click **Next**.

5. License Activation (Step 2 of 5)

- Change the ISV from *reprise* to **extendsim**. → ISV:
 (Note: Enter *extendsim* all in lower case as the ISV is case specific.)
- Enter your License Activation Key, including dashes. → License Activation Key:
- Click **Next**.

6. License Activation (Step 3 of 5)

- Don't make any changes to the *License Server hostid*. → License Server or Node-Locked hostid:
- Change the *License count (for Floating licenses)* from 1 to 0. A zero indicates that none of the licenses will be held back from being used on this Cloud Server. → License count (for Floating licenses):
- Click **Next**.

7. License Activation (Step 4 of 5)

- For *License File to create or edit*, change *.\activate1.lic* to **extendsim.lic** (without the *.*, **, or *1*). → License File to create or edit:
- Click **Next**.

8. License Activation (Step 5 of 5)

- Verify the information:
 - ISV is *extendsim* →
 - Activation Key is entered correctly with dashes →
 - Count is 0 →
 - License file is *extendsim.lic* (without the *.*, **, or *1*) →
- If information is not correct, go **Back** and correct it.
- If information is correct, click **Request License**. →

| Activation Request Data: | |
|--------------------------|--------------------------|
| Activation Server | www.hostedactivation.com |
| ISV | extendsim |
| Activation Key | 1234-5678-9098-7654 |
| Count | 0 |
| Hostid | f06da4f564f7 |
| License File | extendsim.lic |

REQUEST LICENSE
 <- Back

9. License Activation window. Which window do you see?



License Activation - license retrieved
 Writing License to extendsim.lic:
 HOST ExtendSimLicenseServer f06da4f564f7
 ISV extendsim

No error messages? The license has been successfully activated, but you still need to generate the license file. Proceed to #10.

License Activation - license retrieved
 Error generating License: -132
 Cannot connect to specified URL (-132)
 Attempting to access license generator at: www.hostedactivation.com

Any error message? **STOP HERE**. Don't continue in this section. Instead note the name and number of the error message, then go to *License Manager • Manual In-House Activation* beginning on page 13 of this document.

Step 1b • Activate the License Manager -- continued

10. If there are no error messages in the License Activation window, click the **(RE)START LICENSE SERVER** button (this does not restart the Server; it only restarts the License Manager so that it reads the license file).
11. In the *Reread/Restart Servers* window:
 - Don't make any changes to the *ISV=* popup.  ISV=
 - Click the **RERead/RESTART** button.
 - You will get the message *Reread command sent...* to all servers or to ExtendSim.
12. Verify information by clicking the Status command on the left side of the RLSA window:
 - If the Status command reports *No ISV Servers running*, you've made an error. Restart at Part 1b, #2 on page 5.
 - If instead the ISV Servers panel (shown here) is present:
 - Is the ISV port listed in the panel blocked? Either unblock it for outbound access (preferred) or set a new port number in the license file as discussed in the *ExtendSim Cloud User Guide*.
 - Does the Status report that the ISV server is running, as shown? 
13. If the ISV Server for *extendsim* is running, close the browser.
14. Make a copy of the *extendsim.lic* file for use in activating ExtendSim on each Cloud Server.
 - By default, the license file is located on the Server at *C:\ExtendSimFloatingLicenseServer*.
 - If you subsequently edit the license file, such as changing the ISV port, distribute the modified license file!
15. Install ExtendSim Cloud on Cloud Server(s) as indicated on page 7.

| ISV Servers | | | | | |
|-------------|-------|---------|----------|---------------|---------------|
| Name | port | Running | Restarts | Server Status | License Usage |
| extendsim | 51006 | Yes | 0 | extendsim | extendsim |

Common errors when activating the License Manager

- Not unblocking the required ports - 5053 and the ISV port (by default, 51006).
- Setting a custom ISV port rather than the default port (51006).
- Not installing the License Manager with elevated or administrative privileges.
- Not entering 0 for the count during #6 (Step 3 of 5).
- Installing on a virtual server that uses dynamic MAC/Ethernet addresses.
- Continuing to try to do an automatic activation after receiving an error message in the License Activation window in #9.

ExtendSim Cloud Installation & Activation Instructions

Step 2a • Install ExtendSim Cloud and Backend Files on a Cloud Server

Note 1: You can install ExtendSim Cloud on as many Cloud Servers as you want. However, *only install one time on each Cloud Server*. To install Cloud on multiple Cloud Servers, follow the instructions for one Cloud Server, then clone everything to the other servers.

Note 2: Do not download or use a Trial version of ExtendSim; Trial versions do not have the correct files or settings for a Cloud license.

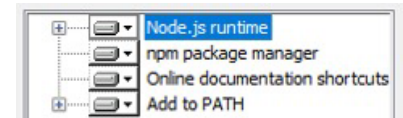
1. Use the **ExtendSimCloud.exe** installer from the Cloud License package. (Do not use a Trial version of ExtendSim!)
2. Running the installer with elevated privileges, install on a Cloud Server following the installer's instructions.
3. During installation, 3 applications will be installed, requiring acceptance of 3 license agreements:

- **ExtendSimCloud Installer**

- The default destination folder is *C:\Users\UserName\Documents*. This is where user-modifiable files (examples & libraries) will be installed. Whichever destination folder you pick, the install location **must have read/write access**.
- Once the ExtendSim installation has completed, two installation dialogs should appear, one for Node.js and the other for MongoDB.

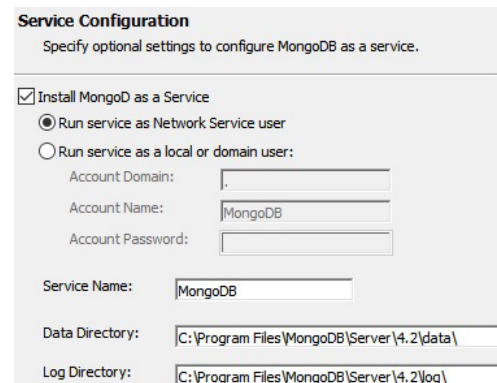
- **Node.js Setup Wizard** (Note: if Node.js is already installed, just click *Cancel*)

- The default **Destination Folder** is *C:\Program Files\nodejs*.
- For the **Custom Setup**, choose *Node.js runtime* (the default).
- **Do not** install the tools in the **Tools for Native Modules** dialog. Instead, just click *Next*.
- At the next window, click *Install*. When done, click *Finish*.



- **MongoDB Setup Wizard** (Note: if MongoDB is already installed just click *Cancel*)

- In the **Choose Setup Type** dialog, click *Complete*.
- For the **Service Configuration**, use the default settings as shown here. The *Data* and *Log* directories should be installed to the same directory where the ExtendSim application was installed.
- Uncheck the box in the **Install MongoDB Compass** dialog so that you **DO NOT Install MongoDB Compass**. Then click *Next*.
- At the next window, click *Install*. When done, click *Finish*. This also starts the MongoDB service running.



4. After the 3 applications have been installed, click *Finish* in the ExtendSim "Installation Succeeded" window.
5. A shortcut for the configuration file, *ES Cloud Config*, will be installed on your desktop for later use.

Step 2b • Activate ExtendSim on the Cloud Server

1. Before launching ExtendSim, copy the license file (*extendsim.lic*) that is on the License Server (by default, the license file is located at the root of the License Server's C drive in the folder named *ExtendSimFloatingLicenseServer*).
2. Paste a copy of the *extendsim.lic* file into the folder that contains the user-modifiable files (by default that folder is named *UserName/Documents/ExtendSimCloud*). **Note that there must be read/write access to that folder.**
3. To test that the activation is successful, launch ExtendSim Cloud. Information about the license (Subscription renewal date, concurrent limit, and so forth) will be on its startup screen (found at *Help > About ExtendSim*).

Step 2c • Copy Files into the Appropriate Folders on the Cloud Server

On the Cloud Server, copy your custom files to the appropriate locations within the ExtendSimCloud folder that contains the user-modifiable files (by default, into the *UserName/Documents/ExtendSimCloud* folder).

1. Libraries • Copy any custom libraries into the Libraries folder.
2. Extensions • Copy any custom extensions, such as DLLs and includes, into the appropriate folders.
3. Models • You will copy model files onto the Cloud Server later, after you create User Group folders.
Note: libraries and extensions must be in their appropriate folders not in the model folder!

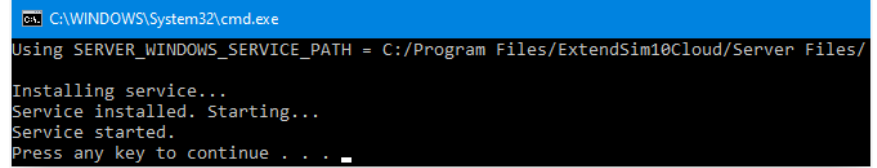
Launch the Cloud Services Manager

Step 3 • Start the Cloud Services Manager Running as a Service on Each Cloud Server

So that Cloud components can interact, the *Cloud Services Manager* must be running. It can run continuously as a service or be launched only when needed.

1. To start the *Cloud Services Manager* running as a service:

- With elevated privileges, run the *install-windows-service.bat* file, located at *Program Files/ExtendSimCloud/Server Files*.



```
C:\WINDOWS\System32\cmd.exe
Using SERVER_WINDOWS_SERVICE_PATH = C:/Program Files/ExtendSim10Cloud/Server Files/
Installing service...
Service installed. Starting...
Service started.
Press any key to continue . . .
```

- If successful, *ExtendSimCloud Services Manager* will appear in the list of Windows Services and one or more instances of *ExtendSim Cloud* will be running on the Cloud Server.

| | | |
|-----------------------------------|-------|---------|
| ExtendSim.exe | 11064 | Running |
| ExtendSim.exe | 2524 | Running |
| extendsimcloudservicesmanager.exe | 3984 | Running |

(The number of instances is determined by the number you entered for *EXTENDSIM_INSTANCES* in the configuration file.)

- To verify that the service is running and that the *Cloud Services Manager* has launched multiple *ExtendSim* instances, start the *Task Manager* and go to the *Details* tab.
- To stop and remove the service, run the *uninstall-windows-service.bat* file.

2. To manually launch the *Cloud Services Manager*:

- With elevated privileges, launch the *start.bat* file, located at *Program Files/ExtendSim Cloud/Server Files*.
- This opens the command prompt and runs the *Cloud Services Manager*, showing the log in the same window.
- When the command prompt is closed, the *Cloud Services Manager* is stopped along with all the *ExtendSim Cloud* instances the *Cloud Services Manager* opened.

Configure the Cloud Environment

Step 4 • Enter Values for the Cloud Service Manager Parameters

Each setting in the *Cloud Configuration Manager* specifies some aspect of your Cloud situation, such as how many cores the Cloud Server has, paths to the directories, and whether you want *ExtendSim* to launch headless or not.

1. With elevated privileges, launch the configuration application:

- If you allowed the configuration shortcut *ES Cloud Config* to be placed on the server's desktop during the installation of the *ExtendSim Cloud* files, run the shortcut with elevated privileges.
- If the shortcut isn't present, navigate to the Cloud Server's *Program Files/ExtendSimCloud/Server Files* folder and launch the *ExtendSimCloudConfigurationManager.exe* file with elevated privileges.

2. If necessary, use the button at the top of the configuration window to browse to the *Server Files* folder on this Cloud Server. By default, that would be *Program Files/ExtendSimCloud/Server Files*.

3. The configuration table has two columns: *Parameter Name* and *Parameter Value*. The parameters are listed on the next two pages (**bold** parameters require an entry; others are optional).

4. When you have finished entering valid parameter values, click *Save Settings*. A window will indicate that the *.env configuration file* has successfully been updated. You can then *Exit* the *Cloud Configuration Manager*.

5. To change the settings after you have saved them, enter the new settings in the configuration application. Then, restart the *Cloud Services Manager*, either by restarting the service *ExtendSimCloudServicesManager* (if that is running) or by running the *startup.bat* file as Administrator. Both methods reload the configuration parameters.

Step 4 • Enter Values for the Cloud Services Manager Parameters -- continued

- **EXTENDSIM_APPLICATION_PATH** • set this to be the path to the ExtendSim Cloud folder that contains the ExtendSim application (ExtendSim.exe). By default, that would be *C:/Program Files/ExtendSimCloud*.
- **EXTENDSIM_AVAILABILITY_CHECK_DELAY_AFTER_START** • keep the default value (2000 milliseconds) unless you want to change the number. When the Cloud Services Manager (CSM) spawns an instance of ExtendSim, it checks to see if it can connect to that instance before marking it as AVAILABLE. This parameter specifies how long the CSM should wait, in milliseconds, after spawning an ExtendSim instance but before seeing if it can connect to it through its dedicated port. The purpose of this is to ensure that the CSM doesn't try to test the connection before ExtendSim has completed launching that instance.
- **EXTENDSIM_AVAILABILITY_CHECK_DELAY_WHEN_BUSY** • keep the default value (1000 milliseconds) unless you want to change the duration. This parameter specifies the duration of time (in milliseconds) the Cloud Services Manager will wait before attempting to find an idle ExtendSim instance.
- **EXTENDSIM_HEADLESS** • the default is *No*. When starting the Cloud Server for the first time, it is recommended that you leave this set to *No* so that spawned instances of ExtendSim will run non-headless. This will allow you to respond to any firewall messages that might appear the first time ExtendSim Cloud is launched. After that, change the value to *Yes* unless you want to run in non-headless mode to debug problems.
- **EXTENDSIM_INSTANCES** • the default is 2. Set this to the number of cores available on the Cloud Server. Concurrent requests for ExtendSim instances will be queued if they exceed the lower of that number or the maximum allowed per your license.
- **EXTENDSIM_INSTANCE_ADDRESS** • if needed, change this to match the IP address of the server where the ExtendSim Cloud application is installed. That is, the IP4 address of the ExtendSim Cloud Server.
- **EXTENDSIM_INSTANCE_BASE_PORT** • keep the default port number (3750) unless you want to change the port. This is the base port number in the contiguous range of ports that spawned instances of ExtendSim will use to listen for requests made by the Cloud Services Manager. As each ExtendSim instance is spawned, it is assigned a port number based on this number, plus the number of instances currently active, minus 1. ExtendSim instances listen on their dedicated ports for requests from the Cloud Services Manager.
- **EXTENDSIM_MODEL_INFO_BLOCK_NAME** • keep the default (executive, model info). If your simulation models are discrete event or discrete rate, the *Executive* block gathers the needed information from your models. If your models are continuous process, the *Model Info* block gathers the info. **Note: every continuous model (i.e., any model that does not have an Executive block), must include a Model Info block from the Utilities library.**
- **EXTENDSIM_MODEL_RUN_COMPLETION_CHECK_ATTEMPTS** • keep the default value (200 attempts) unless you want to change the number. This parameter is used to set the maximum number of times the Cloud Services Manager will recheck the status of a running simulation to determine if it has completed.
- **EXTENDSIM_MODEL_RUN_COMPLETION_CHECK_DELAY** • keep the default value (5000 milliseconds) unless you want to change the number. This is set to the duration, in milliseconds, that the Cloud Services Manager will wait before re-checking the status of a running simulation. When a simulation run is started on one of the ExtendSim instances, the Cloud Services Manager periodically checks the status of the simulation run until it completes. The duration of this checking period is specified by this parameter. The Cloud Services Manager continues checking the status of a particular simulation run until either the simulation run completes or the maximum number of attempts have been made to determine if the simulation run has completed. If the maximum has been reached, the Cloud Services Manager attempts to force the simulation to stop or restarts the associated ExtendSim instance.
- **EXTENDSIM_REQUESTS_TIMEOUT** • keep the default value (17500 milliseconds) unless you want to change the number. This is how long, in milliseconds, the Cloud Services Manager will continue making requests to an ExtendSim instance to determine if it is still running a simulation. The purpose of this is to handle situations in which running an ExtendSim instance is stuck in an infinite loop.
- **EXTENDSIM_RESTART_AFTER_X_RUNS** • keep the default value (5) unless you want to change the number. Determines the total number of runs allowed for an automatically launched instance of ExtendSim before the Cloud Services Manager quits the instance and restarts a new one listening on the same port.

Step 4 • Enter Values for the Cloud Services Manager Parameters -- continued

- **EXTENDSIM_SCENARIOS_DIRECTORY_PATH** • set this to be the path to the directory named *ExtendSim Scenario Folders*. Click in the Value field to browse to the *ExtendSim Scenario Folders* location on the Cloud Server (by default, that would be *C:/Users/UserName/Documents/ExtendSimCloud/ExtendSim Scenario Folders*). Note, you can move the scenario folder anywhere on the Cloud Server as long as this configuration setting points to its location. The scenario folder is where ExtendSim models will be run from, after being copied from the *ExtendSim Reference Models* folders that contain user models.
- **SERVER_AUTH_JWT** • the default is *no*; set to *yes* or *no* depending on whether you want to use JSON web tokens when making requests from the client app to the Cloud Server. If *yes*, the client app must manage the tokens created by the Cloud Services Manager when users first login and pass these tokens in the headers of all requests made to the Cloud Server. For more information, see the *ExtendSim Cloud User Guide*.
- **SERVER_AUTH_JWT_EXPIRATION** • keep the default value (10h) unless you want to change it; the value is in hours.
- **SERVER_AUTH_JWT_SECRET** • keep the default value of *NxV7s8*.
- **SERVER_HTTPS** • the default is *No*, which means the Cloud Services Manager will only use Hypertext Transfer Protocol (HTTP) for all communications between itself and a remote client device. If you have valid SSL certificates, you can set this to *Yes* to use HTTP in combination with the Secure Socket Layer (SSL)/Transport Layer Security (TLS) protocol for those communications. If you choose “Yes”, enter appropriate values for the next 3 parameters.
- **SERVER_HTTPS_CERT_PATH** • no need to change unless you’re using HTTPS protocol. In that case, set this to the complete path specification of a valid PEM container file containing the SSL certificates that you will use for your ExtendSim Cloud Server. The default path is *C:/Users/UserName/Documents/ExtendSimCloud/cert.pem*.
- **SERVER_HTTPS_KEY_PATH** • no need to change unless you’re using HTTPS protocol. In that case, set this to the complete path specification of a valid PEM container file containing private cryptographic keys for the SSL certificates that you will use for your ExtendSim Cloud Server. The default is *C:/Users/UserName/Documents/ExtendSimCloud/key.pem*.
- **SERVER_HTTPS_MAINTAINER_EMAIL** • no need to change unless you’re using HTTPS protocol. In that case, set this to be the email address of the contact for security and critical bug notices.
- **SERVER_MONGODB_URI** • keep the default value *mongodb://localhost:27017/ExtendSimCloud_usersdb*.
- **SERVER_PORT** • keep the default value (3501) unless you want to change the port number. The Cloud Services Manager will use this port to respond to remote requests from client apps.
- **SERVER_WINDOWS_SERVICE_PATH** • set this to be the path to the *Server Files* folder. By default, that path would be *C:/Program Files/ExtendSimCloud/Server Files*. As discussed later in these instructions, that folder contains the *install-windows-service.bat* file you can use to setup the Cloud Services Manager as a Windows service.

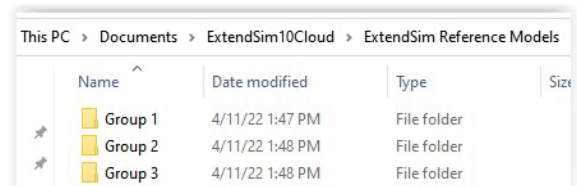
Configure Users and User Groups

User Group folders and User Groups control which end-user clients have access to which models on the Cloud Server.

Step 5a • Create User Group Folders

User Group folders store the reference models users will have access to. To provide a default location for User Group folders, the ExtendSim Cloud installer created an *ExtendSim Reference Models* folder in the *Documents/ExtendSimCloud* folder. You can, however, create User Group folders anywhere on the Cloud Server as long as the user has Read/Write permissions to those folders and the paths to the folders are specified when you set up the User Groups (discussed later).

1. Create empty User Group folders, either within the *ExtendSim Reference Models* folder (located by default in the *UserName/Documents/ExtendSimCloud* folder) or elsewhere on the Cloud Server.
2. Copy ExtendSim models and any required ancillary files (e.g., spreadsheets) into the appropriate User Group folders.
Note 1: Do not copy libraries or extensions into these folders!
Note 2: Continuous models must include a *Model Info* block from the Utilities library.



| Name | Date modified | Type | Size |
|---------|-----------------|-------------|------|
| Group 1 | 4/11/22 1:47 PM | File folder | |
| Group 2 | 4/11/22 1:48 PM | File folder | |
| Group 3 | 4/11/22 1:48 PM | File folder | |

3. Document the full path to the *ExtendSim Reference Models* folder. You will use that below.

Step 5b • Set Up User Groups Linking Them to a User Group Folder

1. With administrator privileges, launch Notepad or something similar, and use its File menu to Open the *import-user-groups.json* file that is located in the *Program Files/ExtendSimCloud/Server Files/MongoDB* folder.

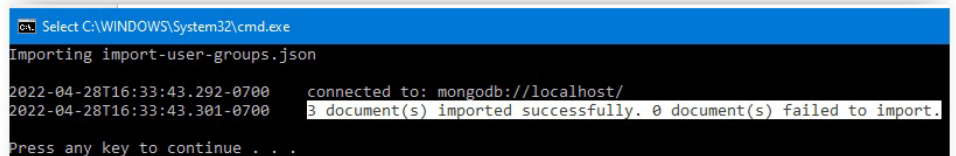
2. Edit the file as follows:

- *Group* can be any alphanumeric or numeric name as long as it not the same name as any other group.
- *Model Path* specifies the path to the User Group folders you created above.
 - Verify that the folder name is correct and that the path is enclosed in quotation marks.
 - If the model path has backslashes \ instead of forward slashes /, you must use a double backslash \\.
- Separate multiple groups by placing a comma after the right brace }, as shown.
- Repeat as needed. However, do not put a comma after the final right brace.
- Save and close the file.

```
[
  {
    "group": "Team 1",
    "model_path": "C:/Users/ComputerName/ExtendSimCloud/ExtendSim Reference Models/Group 1"
  },
  {
    "group": "Team 2",
    "model_path": "C:/Users/ComputerName/ExtendSimCloud/ExtendSim Reference Models/Group 2"
  },
  {
    "group": "Tom and Sally",
    "model_path": "C:/Users/ComputerName/ExtendSimCloud/ExtendSim Reference Models/Group 3"
  }
]
```

Step 5c • Run the Batch File to Store the Information in MongoDB

1. Running the batch file creates a database (*ExtendSimCloud_usersdb*) in MongoDB where all the user group information is stored. Note that the *Cloud Services Manager* must be running for this step.
2. With elevated privileges, launch the *import-user-groups.bat* file at *Program Files/ExtendSimCloud/Server Files/MongoDB*.
3. If successful, it should report a number of documents imported successfully, where all of the groups are imported and each document represents one of the groups you created, as shown here.



```
cmd Select C:\WINDOWS\System32\cmd.exe
Importing import-user-groups.json
2022-04-28T16:33:43.292-0700 connected to: mongod://localhost/
2022-04-28T16:33:43.301-0700 3 document(s) imported successfully. 0 document(s) failed to import.
Press any key to continue . . .
```

Note: the *ExtendSimCloud_usersdb* database is embedded within the files in the folder *Program Files/MongoDB/Server/Data*. To access the database, use a MongoDB GUI such as *Robo 3T*.

User Authentication

Step 6 • Create Authenticated Users

To control who has access to the models on the Cloud Server, users must be authenticatable. This is accomplished differently depending on which frontend interface end users will use: the *Cloud Scenario Manager* or a *frontend application built with the ExtendSim Cloud API*. In either case, the *Cloud Services Manager* must be running.

1. The *Cloud Scenario Manager* requires that the user register using an authorization code and then create a user name and password. The process to create and use the authorization code is described in the *ExtendSim Cloud User Guide*.
2. For the custom frontend application, authentication is performed by calling the *signup* API function from the client application. The *signup* function requires 3 arguments:

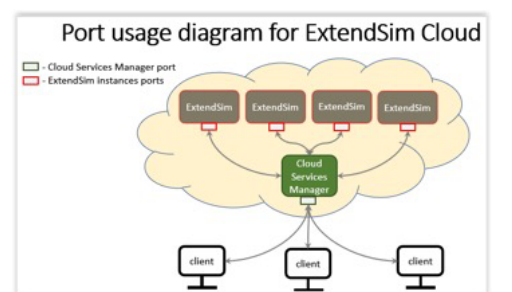
- username
- password
- user group

See the *ExtendSim Cloud User Guide* for details; see the *ExtendSim Cloud Technical Reference* for the API.

Open Communication Channels (Ports)

Step 7 • Open the Required Ports

1. On the License Server (*where the License Manager is installed*)
 - Unblock port 5054 (a web server port) so you can use a browser to communicate with the License Manager for activation, reactivation, and obtaining status information.
 - Two ports (5053 and an ISV port) must be open for inbound access on the License Server so RLM can receive license requests and to allow internal communications between Server files. By default, the TCP server port is 5053 and the ISV port is 51006. If necessary, they can be changed in the license file (*extendsim.lic*) as discussed in the *ExtendSim Cloud User Guide*.
2. On the Cloud Server (*where ExtendSim Cloud is installed*)
 - Two ports (5053 and the ISV port) must be open for outbound access so instances of ExtendSim can request licenses from the License Manager on the License Server. By default, the TCP server port is 5053 and the ISV port is 51006. If necessary, they can be changed in the license file (*extendsim.lic*) as discussed in the *ExtendSim Cloud User Guide*.
 - A Cloud Services Manager port must be open for inbound access to enable the servicing of all requests from client systems. The default port is 3501; it can be changed in the *.env* file's *SERVER_PORT* setting.
3. ExtendSim instances ports
 - Starting with a base port, a contiguous range of ports must be unblocked to allow each running instance of ExtendSim to have its own port for communication with the Cloud Services Manager.
 - Whenever the Cloud Services Manager launches a new instance of ExtendSim in memory, it dynamically assigns a port to it. The first instance of ExtendSim to be launched in memory will always be assigned the base ExtendSim port number. The default base port is 3750; if needed, it can be changed in the *.env* file's *EXTENDSIM_INSTANCE_BASE_PORT* setting.
 - The port number will be incremented by 1 for each successive instance of ExtendSim that is launched.
 - The total number of ExtendSim instances ports required will depend on the maximum number of concurrently running ExtendSim instances that can occur. That maximum is the smaller of:
 - The value of the *EXTENDSIM_INSTANCES* parameter in the *.env* file.
 - The maximum number of concurrent ExtendSim instances allowed for the license you purchased.
4. The Database port
 - MongoDB data repository runs as a service to communicate with the *Cloud Services Manager*.
 - The default port is 27017. It can be changed in the configuration file's *SERVER_MONGODB_URI* setting.



Create the Client Frontend Interface

Step 8 • Create a GUI so the End User Can Submit Scenarios

A client app provides an interface for communicating with the remote Cloud framework. The client app can be either:

1. A web page running in a browser.
2. A standalone program on the client's device.

The *Cloud Scenario Manager.html* file (located at *Program Files/ExtendSimCloud/Client Files*) is web-based frontend template implemented in HTML, CSS, and JavaScript. It uses a web browser as a front end to communicate with the Cloud Services Manager running in the backend. It also demonstrates how to use JavaScript to execute all of the Cloud Services Manager API functions.

You can customize the Cloud Scenario Manager template for your use or create a client app using any standard *http* compatible language, e.g., Python, JavaScript, C# that is capable of properly using the Cloud Services Manager API functions for communication.

For more information, see the *ExtendSim Cloud User Guide* and the *ExtendSim Cloud Technical Reference*; both are located in the *Documents/ExtendSimCloud/Documentation* folder.

Manual In-House Activation of the License Manager on the Server

Manual Activation of the License Manager on the Server -- use only if unable to automatically activate

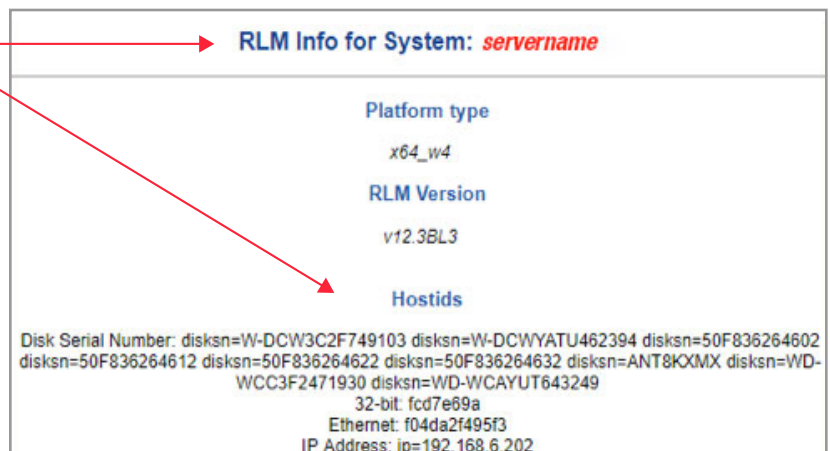
During the activation process, if the License Activation window displays **ANY** error messages (e.g. *Error generating license or -132*), the automated activation couldn't happen. In this case you need to do a manual activation. This involves you sending us some information, us sending you a license file, and you activating the license locally.

1. Click the **System Info** command on the left of the RLSA window and copy or write down:

- a. The **name of the Server** as shown in the text *RLM Info for System: **servername***.
- b. The **Hostid**. If there are multiple **Hostid's**, copy the first one - either the first Disk Serial Number (e.g. "disksn=W-DCW3C2F749103") or the Ethernet number (e.g. f04da2f495f3).

2. Using an email that can receive an attached text file in return, email the following four (4) pieces of information to Sales.ExtendSim@Andritz.com:

- Your Activation Key
- The Server's name from the System Info command
- The Hostid from the System Info command
- The name and number, or a screen shot, of the error message from Part 1B, #9



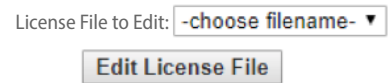
3. You can close the browser until we send you the license. After we receive the information, we will generate a text file named *extendsim.lic* and email it to you. (This could take up to 3 days.)

Manual Activation of the License Manager on the Server - continued

4. After you receive the license file from us, open the RLSA window using a browser:
 - a. If you open the browser on the Server where you've installed the License Manager, enter "**localhost:5054**" in the browser's address line and press Enter. (If your browser inserts the text *https://* in the address line, remove that text so the address line is just **localhost:5054**.)
 - b. If you open the browser on another device:
 - It must be on the same network as the device where you installed the License Manager.
 - Enter "**servername:5054**" in the browser's address line and press Enter. (Be sure *servername* is the name of the License Server where the License Manager installed and the text in the address line does not include *https://*.)
5. On the left side of the Reprise License Server Administration (RLSA) window, click the **Edit License Files** command.

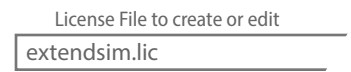
6. In the *Edit License File* window that appears:

- Do not change the *License File to Edit* field.
- Click the **Edit License File** button.



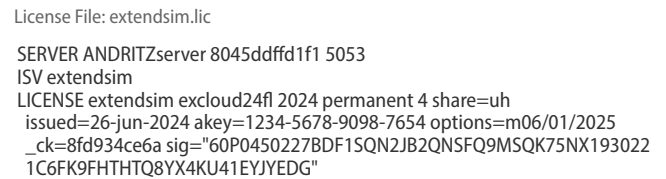
7. In the next window:

- For *License File to create or edit*: enter **extendsim.lic**.
- Click the **Edit License File** button.



8. In the next window:

- Copy the **contents** of the *extendsim.lic* file and paste the contents into the field.
- Scroll to the bottom of the window and click **Update License File**.



9. In the next window:

- You should get the message *license file extendsim.lic written*.
- Click the **Back to Status** button.

10. On the left-hand side of the RLSA window, click the **Reread/Restart Servers** command (this does not restart the Server; it only restarts the License Manager).

11. In the *Edit License File* window that appears:

- Don't make any changes to the *ISV=* popup.
- Click the **REREAD/RESTART** button.
- You will get the message *Reread command sent*.



12. Verify information by clicking the Status command on the left side of the RLSA window.

- If the Status command reports *No ISV Servers running*, you've made an error. Start over.
- Is the ISV port listed in the panel unblocked?
- Is the ISV Server reported as running?

| ISV Servers | | | | | |
|-------------|-------|---------|----------|---------------|---------------|
| Name | port | Running | Restarts | Server Status | License Usage |
| extendsim | 51006 | Yes | 0 | extendsim | extendsim |

13. If the License Manager is running and the ISV port is unblocked, you may close the browser.

14. Make a copy of the *extendsim.lic* file so it can be used to activate each Cloud Server. (Note: If you make any changes to the license file we sent you, such as using a different ISV port, be sure to distribute that modified file.)

15. Install the Cloud applications and files as instructed under ExtendSim Cloud Installation and Activation on page 7.

Common errors when manually activating the License Manager

- Not unblocking the required ports - 5053 and the ISV port (by default, 51006).
- Not installing the License Manager with elevated or administrative privileges.