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EnginFrame Administrator Guide

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Trademarks

Last Update

(rev.)

Latest Version

https://www.enginframe.com

Table of Contents

End of support notice: On September 25, 2025, AWS will discontinue support for NICE EnginFrame. After September 25, 2025, you will no longer be able to access the NICE EnginFrame console or NICE EnginFrame resources. For more information, visit this blog post.

Welcome

About this guide

This guide describes how you can install, configure, and manage a NICE EnginFrame portal instance.

Who this guide is for

This guide is intended for system administrators that install and manage one or more NICE EnginFrame portal instances.

What you should know

This guide assumes the following:

- You're familiar with Unix system administration tasks such as creating user accounts, sharing and mounting Network File System (NFS) partitions, backing up the system.
- You have a foundation in web-related technologies such as the HTTP protocol, the SSL protocol, and the XML language.

Learn about NICE products

World Wide Web

You can find the latest information about NICE EnginFrame on its website: https://www.nice-software.com.

For more information about other NICE products and about the professional services provided by NICE, refer to the company's website: https://www.nice-software.com.

Get technical support

Contact NICE or your EnginFrame reseller for technical support.

NICE support contacts

Use one of the following to contact NICE technical support.

Email

`<helpdesk@nice-software.com>`

World Wide Web

https://www.nice-software.com

Phone

+39 0141 901516

Mail

NICE Support
c/o NICE s.r.l.
Via Milliavacca, 9
14100 Asti
Italy

When contacting the NICE support team, include the full name of your company.

Collect support information

Use "*Support/Collect support info*" service that's described in Operational Dashboard to collect some preliminary data to help NICE support process your support request.

The output of this service is a compressed archive that contains all the gathered information. Send the compressed archive to NICE support team attached to your request.

Getting started

Topics

About NICE EnginFrame

EnginFrame is a grid-enabled application portal for user-friendly HPC job submission, control, and monitoring. It includes sophisticated data management for all stages of job lifetime. It's integrated with most important job schedulers and middleware tools to submit, monitor, and manage jobs.

EnginFrame provides a modular system where you can easily add new functionality, such as application integrations, authentication sources, and license monitoring. It also features a sophisticated web services interface that you can use to enhance existing applications and develop custom solutions for your own environment.

EnginFrame is a computing portal that uses existing scripting solutions when available. This means that, while using EnginFrame, you can avoid interacting with a command line interface in situations where you might have not had that option before.

Based on the latest and most advanced Web 2.0 standards, it provides a flexible infrastructure to support current and future computing needs. It's flexible in content presentation and in providing a personalized experience for users according to their role or operational context.

Note

Starting March 31, 2022, NICE EnginFrame doesn't support VNC®, HP® RGS, VirtualGL, and Amazon DCV 2016 and previous versions.

Note

Starting August 5, 2022, NICE EnginFrame is bundled with an embedded version of Tomcat® that doesn't provide any sample webapps. According to CVE-2022-34305, the sample webapps are affected by a vulnerability. Without the sample webapps, EnginFrame isn't affected by the CVE-2022-34305 vulnerability.

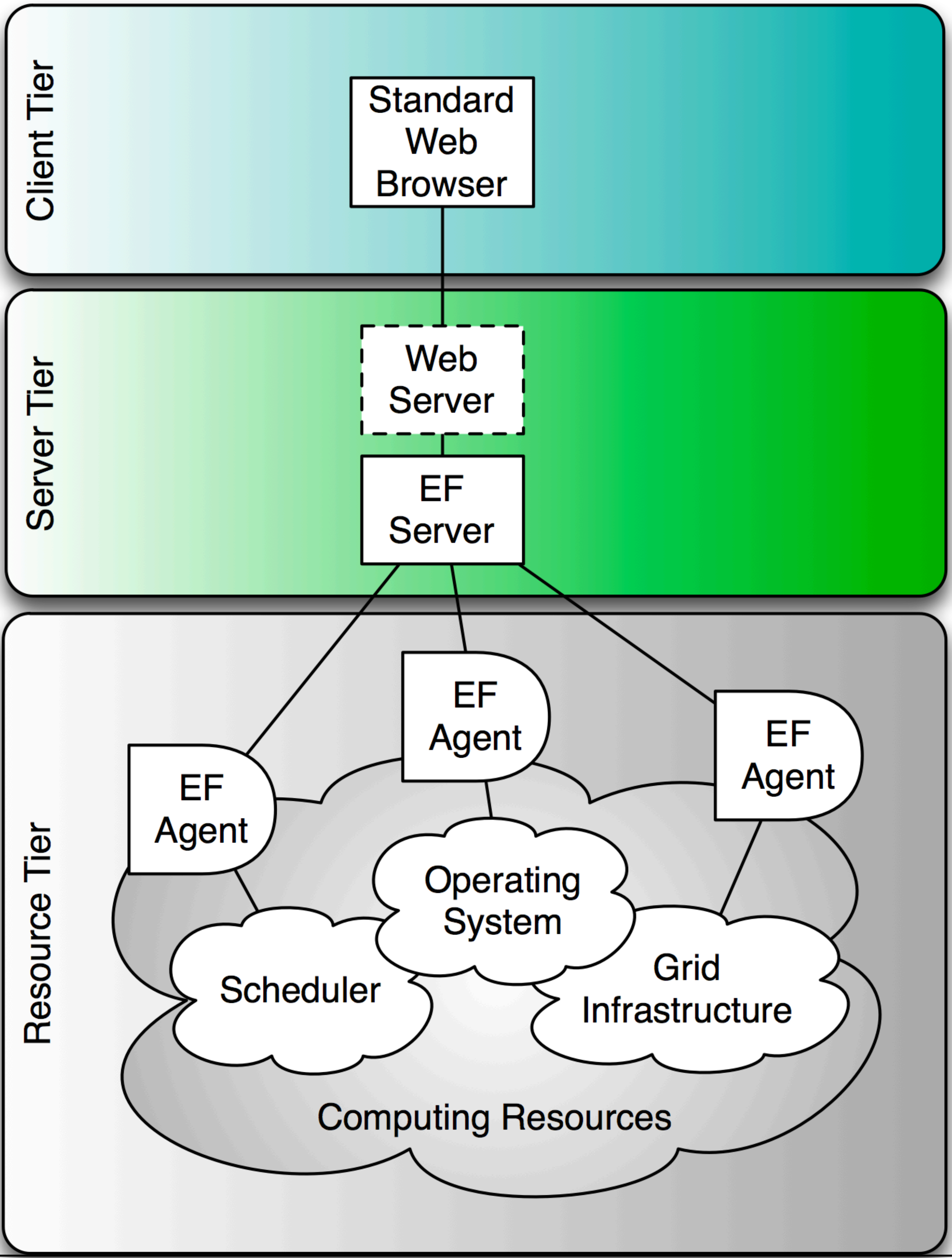
Architectural overview

EnginFrame has an architecture layered into three tiers, as shown in EnginFrame architecture:

- The *Client Tier* usually consists of the user's web browser. It provides an intuitive software interface that uses established web standards such as XHTML and JavaScript®. This tier is independent from the specific software and hardware environment that the end user uses. The Client Tier can also integrate remote visualization technologies such as Amazon DCV.
- The *Server Tier* consists of a *Server* that interacts with EnginFrame Agents and manages the interaction with users.
- The *Resource Tier* consists of one or more *Agents* that are deployed on the back-end infrastructure. Agents manage computing resources on user's behalf and interact with the underlying operating system, job scheduler, or grid infrastructure to run EnginFrame services. For example, they start jobs, move data, and retrieve cluster loads.

Topics

EnginFrame architecture



Basic workflow

EnginFrame abstracts computing resources and data management (*Resource Tier*) and exposes services to users (*Server Tier*). Users access the services directly from their browsers (*Client Tier*).

The internal structure of EnginFrame reflects this high-level architecture and revolves around two main software components: the EnginFrame Server and the EnginFrame Agent.

The EnginFrame Server

> The EnginFrame Server is a Java™ web application. It must be deployed inside a Java Servlet container. It exposes services to users. EnginFrame ships with Apache Tomcat® 9.0.64.

The EnginFrame Agent

> The EnginFrame Agent is a stand-alone Java™ application that manages the computing resources and run services on user's behalf when running as `root`.

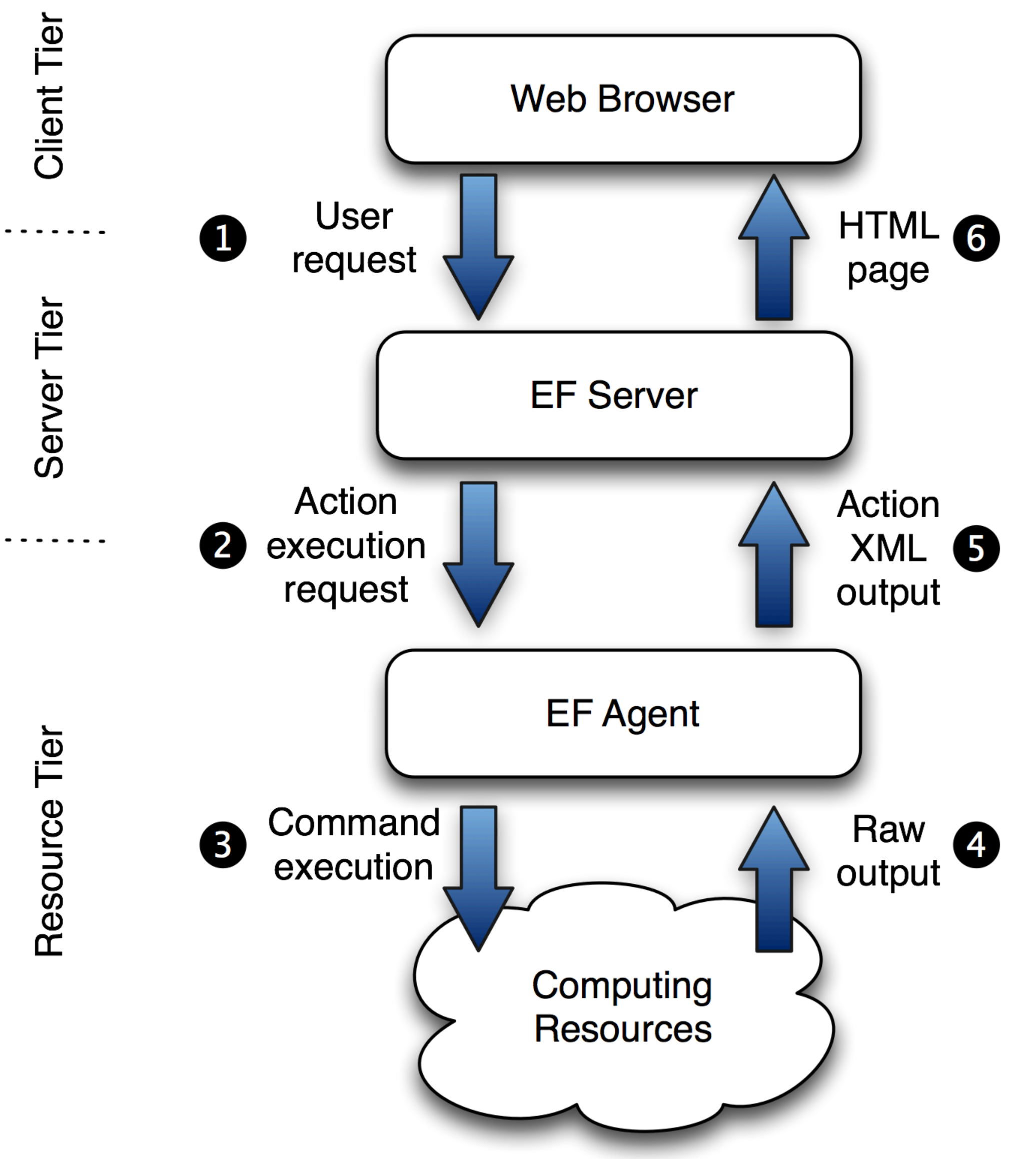
EnginFrame Server receives incoming requests from a web browser. The web browser authenticates and authorizes them, and then asks an EnginFrame Agent to run the required actions. For a visual illustration, see Interaction diagram.

Agents can perform different kinds of actions. This includes running a command on the underlying operating system and submitting a job on the grid infrastructure.

The results of the action that was run are gathered by the Agent and sent back to the Server.

The Server applies some post processing transformations, filters output according to defined access control lists (ACL), and transforms the results into an HTML page.

Interaction diagram



EnginFrame creates or reuses a data area each time a new action is run. This area is called *spooler*.

The spooler is the working directory of the action. It contains files uploaded when the action is submitted. Users can only download files from their spoolers.

The spooler is located on a file-system readable and writable by both Server and Agent. For more information, see Managing spoolers.

Deploying the service

When EnginFrame Portal is installed on one host, it's called a *basic installation*. The Server Tier contains the Agent that's used to access the Resource Tier. The `efnobody` user runs the Server in this scenario. This is the default user that you choose when you install EnginFrame. The EnginFrame Server contains a *local Agent* that's used when configured in your service description and you are submitting a scriptlet. For a visual illustration, see EnginFrame deployed on one host.

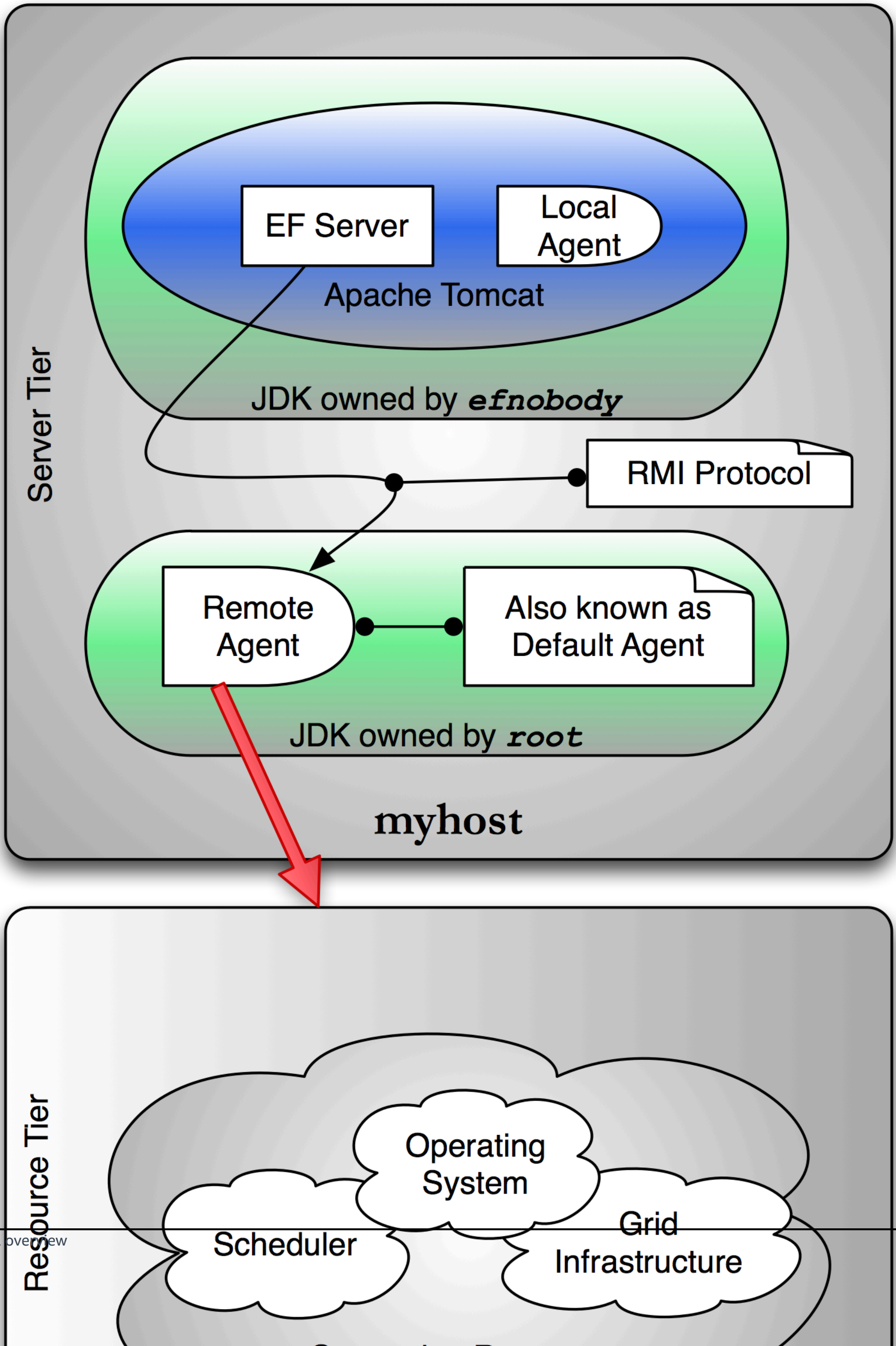
In most cases, the Server contacts the default *remote Agent* that was configured during setup. Usually, the remote Agent runs as `root` and can do the following:

- Authenticate users using PAM/NIS.
- Create or delete spoolers on the user's behalf.
- Run services on the user's behalf.
- Download files on the user's behalf.

The remote Agent can also run as a user without permission. However, you lose the main features of an Agent running as `root`. All spoolers and services are created or run as this user without permission. It also implies that EnginFrame has to use an authentication module that doesn't require `root` privileges to check credentials, such as *LDAP* and *Active Directory*.

The Server communicates with the Remote Agent using Java™ RMI protocol. However, the local Agent is reached directly because it's inside the Java Virtual Machine (JVM) space in the Server.

EnginFrame deployed on one host



Distributed deployment

EnginFrame Server can be deployed in a demilitarized zone (DMZ) that's accessible from your intranet or the internet. The default EnginFrame Agent resides in your protected computing environment. EnginFrame Server and EnginFrame Agent reside on different hosts in this scenario. This is called a *distributed deployment*. For a visual illustration, see EnginFrame deployed on more hosts.

In this scenario, the following requirements must be met:

- The Server host reaches the Agent host on ports that were specified during setup.
- The Agent host reaches the Server host by HTTP on a port that was specified during setup.
- Spoolers are stored on a shared file-system.
- The Spooler shared file-system is readable and writable by both the `efnobody` and `root` users.

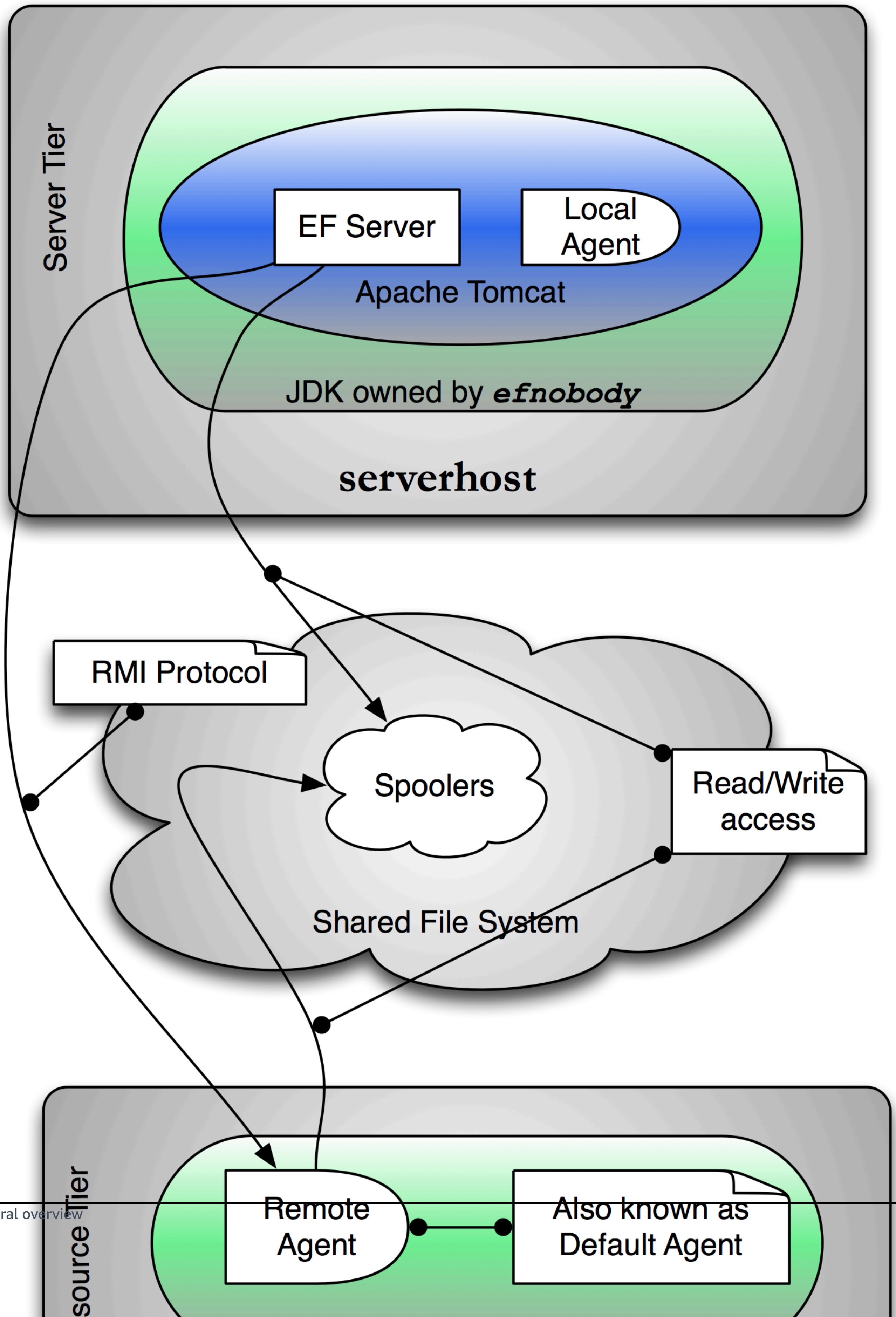
The Server must reach the Agent using RMI. Otherwise, the user's submissions fail.

The Agent must reach the Server using HTTP. Otherwise, the user's downloads fail.

Note

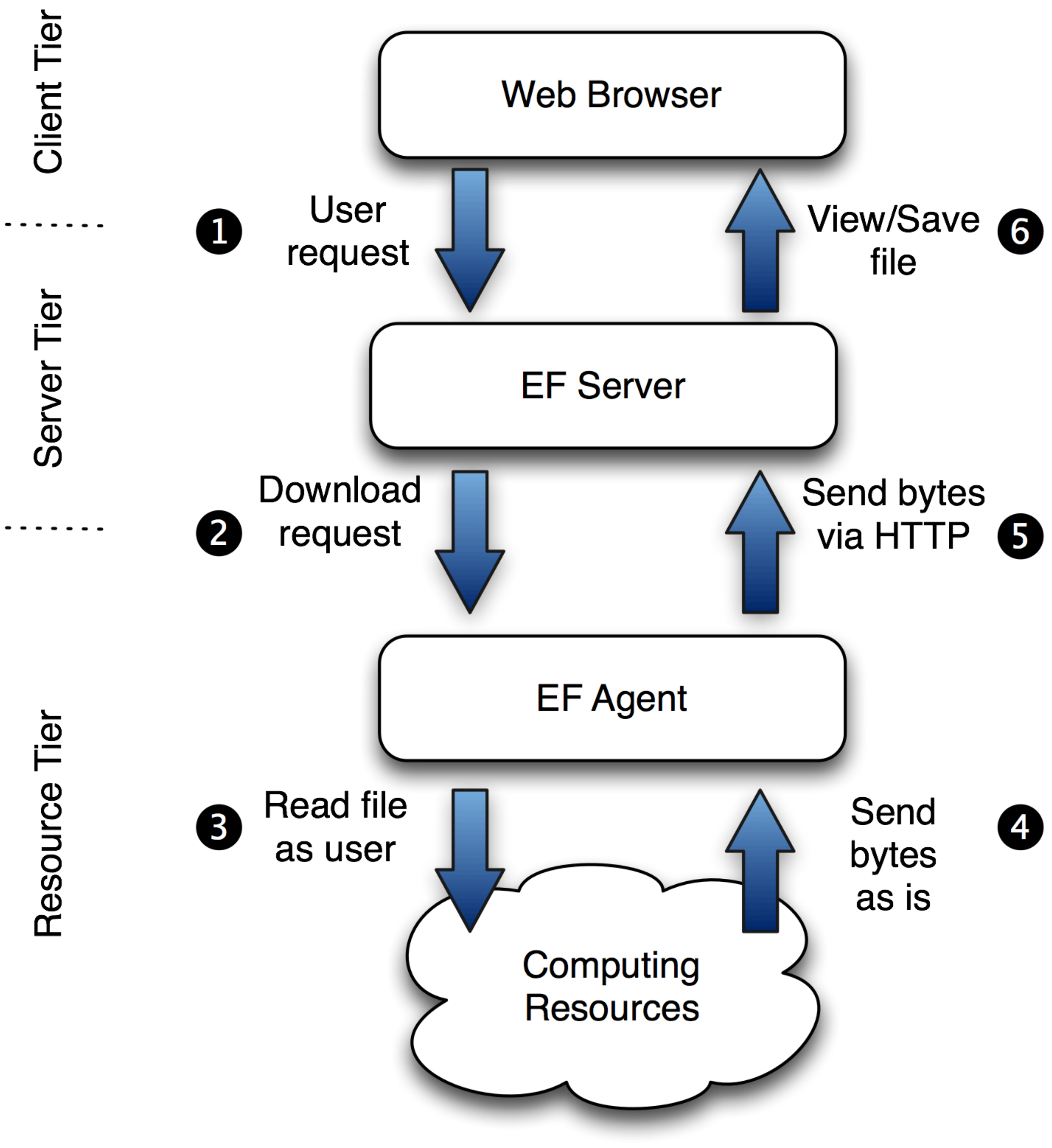
Spoolers must reside on a shared file-system for the following reasons. The Server saves files that users send. A service run on an Agent must access them. Because files are written by the Server, `efnobody` needs read access to traverse the directory structures when creating new spoolers and write access to write files. Because services are run on the user's behalf, `root` needs write permissions on the spoolers area to give directory and files ownership to the user that's running the service. This ownership change is necessary because the spooler and the files were created by `efnobody`.

EnginFrame deployed on more hosts



File downloads

Users can only download files that are contained in their spoolers. The following diagram explains this process flow.



1. EnginFrame Server receives incoming requests from the Web Browser.
2. EnginFrame Server forwards the request to EnginFrame Agent, which then downloads the remote file.

3. As a user, EnginFrame Agent forks a process which reads the file.
4. EnginFrame Agent connects back to EnginFrame Server using HTTP to send back the bytes that were produced by the forked process.
5. EnginFrame Server sends the bytes back to the browser.
6. The browser displays the file or proposes to save it on disk depending on file mime-type and browser settings. For more information, see Managing internet media types.

Step 4 highlights why it's important for EnginFrame Agent to reach EnginFrame Server using HTTP.

You can use EnginFrame to download files in *streaming* mode. File contents are displayed while they're being downloaded. This is useful for files that grow when the service is running. The flow is the same as the remote file download except that EnginFrame Server polls, at fixed intervals, EnginFrame Agent for some fresh data. This feature mimics Unix **tail** that displays the last file portion while it grows.

File download interaction

Interactive session broker

EnginFrame 2021.0 includes the *interactive* plugin, a session broker that's scalable and reliable. Its main purpose is to ease application delivery and manage interactive sessions.

Deployment

The solution relies on the following systems:

- NICE EnginFrame. This is the kernel that Interactive Plugin is built on.
- A resource manager software that allocates and reserves resources according to the specified resource sharing policy or a session broker.
- One or more remote visualization middleware platforms, such as Amazon DCV.

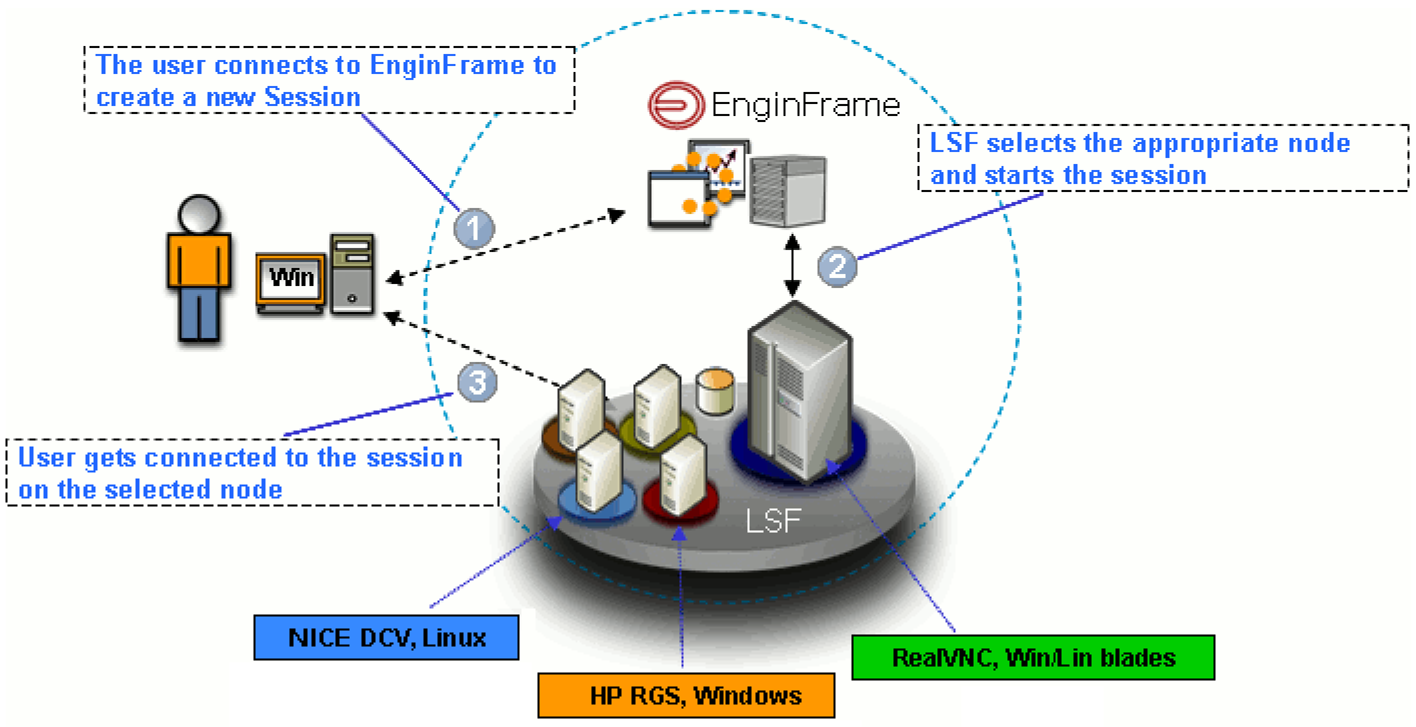
For a complete list of the supported HPC workload managers, session brokers, and visualization middleware, see Prerequisites.

The visualization farm can be Linux® or Windows®.

Workflow

The following picture represents a real-world example infrastructure, including nodes with Amazon DCV, HP® RGS, and RealVNC®. You can use this infrastructure to deliver 2D and 3D applications on Windows® and Linux® through Amazon DCV or VNC®.

Interactive Plugin Use Model


The user connects to EnginFrame to create a new Session
EnginFrame
LSF selects the appropriate node and starts the session
Win
1
2
3
User gets connected to the session on the selected node
LSF
NICE DCV, Linux
HP RGS, Windows
RealVNC, Win/Lin blades

The following explains what happens at each step:

1. The user connects to Interactive Plugin to create a new session. Each session is a distinct job of the underlying HPC workload scheduler or a distinct session in the underlying third-party session broker.
2. The resource manager or the session broker schedules the new session on the most appropriate node. This node complies with the application requirements and the resource sharing policies.
3. After the session is created, Interactive Plugin sends a file to the web browser. This file contains information that allows the browser to start the correct visualization client. The client uses this information to connect to the remote session.

EnginFrame plugins

A plugin is a piece of software that extends EnginFrame Portal. NICE sells and provides many of these extensions at no cost.

The plugins can extend EnginFrame in many different areas:

- **Bundle** - a full-featured package containing other plug-ins.
- **Kernel** - an extension that enhances EnginFrame core system (for example, *WebServices, Interactive Plug-in*).
- **Auth** - an extension that authenticates users against an authoritative source (for example, *PAM Plug-in*).
- **Data** - an extension that helps display data inside EnginFrame Portal (for example, *File Manager, RSpooler Plug-in*).
- **Grid** - an extension that connects EnginFrame Portal with a grid manager (for example, *LSF Plug-in*).
- **Util** - additional utility components (for example, *Demo Portal*).

NICE ships many plugins according to these conventions:

- **Certified extensions** - are developed and supported by NICE. They're available and supported as add-on products. Add-on products pass a quality assurance process at every new release of EnginFrame. Each extension is individually certified to work on the latest release of EnginFrame. The guidelines are provided to evaluate how different groups of extensions might interact. No implicit commitment is taken about the compatibility between two different extensions.
- **Qualified extensions** - are developed or modified by NICE. This ensures a professional development and good functionality under some specific EnginFrame configuration. Qualified extensions are available as project-accelerator solutions, to facilitate integration of your EnginFrame Portal in specific complex scenarios. Further support can be provided as Professional Services.
- **Contributed extensions** - are developed by third parties and are made available by the respective authors. They're provided as-is, and no additional endorsement is provided by NICE. Further support on such modules might be sought from the contributing authors, if available.

EnginFrame Enterprise

This section describes the EnginFrame Enterprise version, the solution aimed at enterprise environments where *load balancing* and *fault tolerance* are crucial requirements.

All the general concepts about EnginFrame explained in the previous sections apply also to EnginFrame Enterprise version. The following sections illustrate the characteristics of the Enterprise solution. They describe the architecture, highlight the differences with the architectures described earlier, and suggest the best approach for deployment.

Topics

Architecture

EnginFrame Enterprise architecture involves multiple EnginFrame Servers and multiple EnginFrame Agents. All the Servers and the Agents maintain the same role and functionalities. However, they do so in an EnginFrame Enterprise infrastructure and EnginFrame Servers are able to communicate with each other over the network to share and manage the system status.

The shared system status involves the following resources:

- The users' spoolers and spoolers repository
- EnginFrame triggers
- Users that are logged in
- EnginFrame license tokens

Information is shared among EnginFrame Servers and managed in a distributed architecture where there's no single point of failure in the system. Each of the servers alone can cover all the needed functionalities and, at the occurrence, it can keep the whole system up and running, making the system more robust and fault tolerant.

The EnginFrame Enterprise solution relies on a file-system that's not only shared between an EnginFrame Server and an EnginFrame Agent. It's shared among all the Servers and Agents.

The EnginFrame Agents need access to the spoolers area. However, EnginFrame Servers have stronger requirements and need other file-system resources to be shared besides spoolers. These include the EnginFrame repository files that contain server-side metadata about spoolers, the file upload cache, and the plugins data directory tree. For more information about the suggested and supported approach for file-system sharing, see Deployment.

Another important component to consider in the EnginFrame architecture is the Database Management System (DBMS). In a standard EnginFrame installation, you can rely on the Apache Derby® database distributed with EnginFrame. In the EnginFrame Enterprise solution, however, use an external JDBC compliant DBMS. All the EnginFrame Servers must have access to the database. For a list of the supported DBMS, see Database management systems.

To maintain a single point of access to EnginFrame, the architecture involves a front-end HTTP/S network load balancer. This component isn't part of the EnginFrame Enterprise deployment. Rather, it's a third-party solution, which might be either a software or hardware component. This might be, for example, a Cisco router of the 6500 or 7600 series. The router, in this example, is configured with the sticky session capability † that dispatches users' requests to the EnginFrame Servers in a balanced way.

NICE can provide and set up the network load balancer based on third-party technology, such as Apache® Web server, as professional services activity according to specific projects with customers.

† Sticky session refers to the feature of many commercial load balancing solutions for web-farms to route the requests for a particular session to the same physical machine that serviced the first request for that session. The balancing occurs on web sessions. It doesn't occur on the single received web requests.

Software distribution and license

EnginFrame Enterprise is distributed with the *same software package* of EnginFrame. It's the EnginFrame software license that specifically enables EnginFrame Enterprise capabilities. EnginFrame doesn't need a license on an EC2 instance. For instructions on how to get the EnginFrame software and license, see Obtaining NICE EnginFrame.

The following is an example of an EnginFrame Enterprise license.

```
<?xml version="1.0"?>
<ef-licenses>
  <ef-license-group product="EnginFrame HPC ENT" release="2015.0" format="2">
```

```
    <ef-license
      component="EF Base"
      vendor="NICE"
      expiration="2015-12-31"
      ip="172.16.10.171,172.16.10.172"
      licensee="NICE RnD Team"
      type="DEMO"
      units="100"
      units-per-user="1"
      license-hosts="false"
      hosts-preemption="false"
      signature="MC0CFQCGPmb31gpiGxxEr0DdyoYud..." <!-- Omitted -->
    />
  </ef-license-group>
</ef-licenses>
```

The `product` attribute value is `EnginFrame HPC ENT`. This value defines an EnginFrame license for HPC environments with the *ENT* string specifying the Enterprise version. The `ip` attribute of tag `ef-license` with the list of the IP addresses of the licensed EnginFrame Servers nodes.

Deployment

Because of its distributed architecture, deployment scenarios of EnginFrame Enterprise might be different and vary in complexity.

You can have each component (specifically EnginFrame Server and Agent) on a different node. You can also decide to pick only the minimum number of parts of the file system to share on each of the node. Remember that, in an EnginFrame Enterprise deployment, you also have file-system resources to be shared among EnginFrame Servers. In many cases, even when resources don't necessarily require sharing, make sure that they're replicated and maintained in alignment among EnginFrame Servers.

Even if, in principle, it's possible to fine-tune the installation of EnginFrame Enterprise, consider the different factors, such as networking and file-system sharing. It's common practice to go for the comparatively fast and easy-to-maintain deployment approach that's described here. If this one doesn't meet your specific requirements, you can use a different approach. Discuss your requirements with NICE professional services to see what is the best approach for you.

The suggested approach to deploy EnginFrame Enterprise involves the following:

- One node for each pair of EnginFrame Server and Agent that you want to install.

- A shared file-system for the whole `$EF_TOP` directory tree.
- `$EF_TOP` is the top EnginFrame installation directory.

For more information, see Installation directories.

With this approach, you can install and manage the software from one node. All the binaries and data directories such as spoolers, sessions, and licenses are shared among the installation nodes.

For those resources that are expected to be local but might conflict in a shared environment, EnginFrame provides a per-hostname directory tree. This directory tree includes a shared environment like the logging directory where each Server and Agent writes log files with the same names.

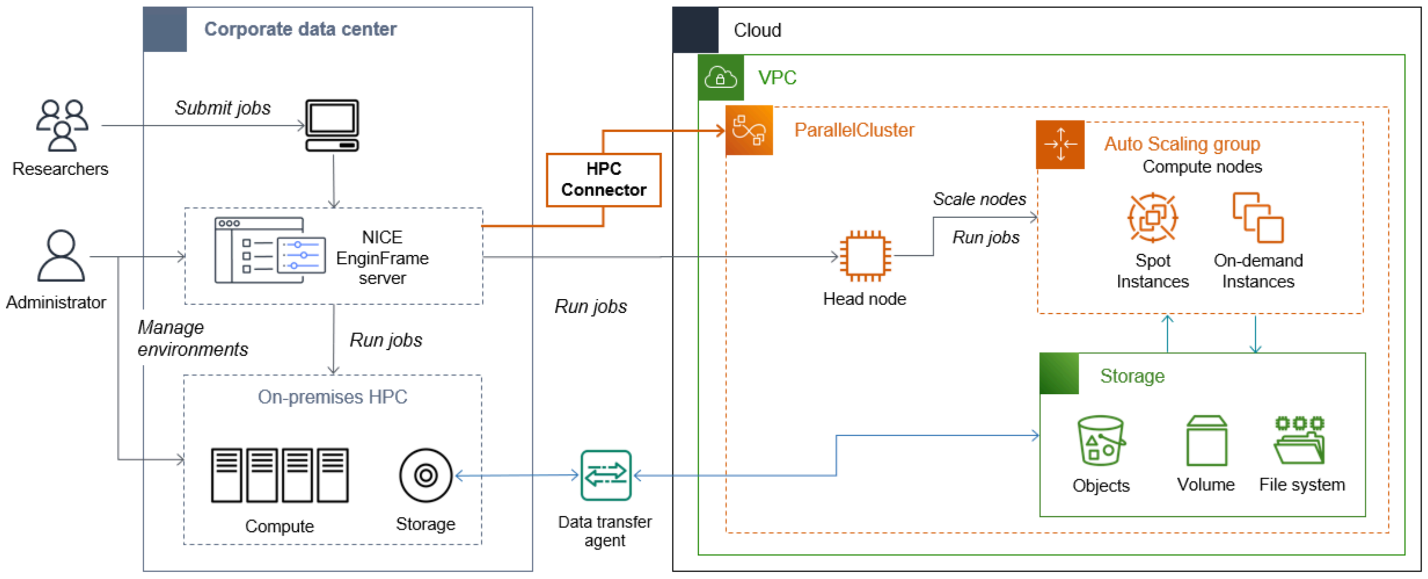
We recommend that you host an external database management system (DBMS) on different nodes and configure them to be fault tolerant.

When you install EnginFrame Enterprise, you insert the JDBC URL in the EnginFrame database instance together with the username and password that you use to access it. The EnginFrame database instance must be previously created empty, EnginFramecreates all the needed tables the first time you connect to it.

The details that specifically concern an EnginFrame Enterprise deployment, its requirements and installation notes, are integrated where needed in the next chapters of this guide.

AWS HPC Connector

HPC Connector provides a straight-forward way for HPC customers to use the elastic infrastructure that AWS ParallelCluster dynamically creates and manages on AWS. You can choose to install EnginFrame on-premises and use HPC Connector to extend available HPC environments to AWS. This installation scenario is suitable for use cases such as cloud bursting. Or, you can install EnginFrame directly on an Amazon EC2 instance and use HPC Connector to run workflows entirely on AWS. HPC Connector uses customer-defined cluster configurations for creating clusters in the cloud that you can use for running jobs.



You can use HPC Connector flexibly as your needs change over time. For example, you can use it to experiment with running select workloads on AWS or to manage most or all of your workloads on AWS. You can use HPC Connector to manage your HPC workloads from both your on-premises and AWS environments in a centralized fashion. For example, you might be migrating your workloads to AWS and need to manage and maintain both environments for some time. Or, you want to burst some workloads to the cloud when on-premises resources are insufficient to meet your requirements. Having access to elastic AWS resources can help to increase the productivity of your researchers. Moreover, you can use HPC Connector to get started managing hybrid on-premises and AWS environments in an more centralized manner.

Topics

How HPC Connector works

HPC Connector works by using AWS ParallelCluster. AWS ParallelCluster is an open-source cluster management tool on AWS that you can use to deploy and manage HPC clusters on AWS. It uses a simple text file to model and provision all the resources needed for your HPC applications in an automated and secure manner. With AWS ParallelCluster, the resources needed for your applications are dynamically scaled in an automated and secure manner. After a burst of jobs is completed, AWS ParallelCluster terminates the instances it created. This leaves only the head node and the minimum capacity defined active and ready to scale up new compute nodes when required.

When submitting a job to a remote cluster hosted on AWS , HPC Connector relies on AWS Systems Manager Session Manager for the job submission process, and uses Amazon S3 for transferring data local to the node running EnginFrame server through and from the remote cluster. In order to do that, HPC Connector requests temporary credentials to AWS Identity and Access Management (IAM) for managing the resources on AWS . When you submit a job to a remote cluster, HPC Connector performs the following activities.

- Creates an Amazon S3 folder for transferring data from the user’s local spooler.
- Generates a dynamic policy to restrict Amazon S3 access to the newly created Amazon S3 folder.
- Creates a new set of temporary credentials that use the generated policy.
- Launches a script for transferring the data that's in the local spooler to S3 using such credentials.
- Runs a remote script on the head node of the remote cluster that uses AWS SSM, which performs the following actions.
  - Retrieves the data from the S3 folder using a set of temporary credentials (using the same mechanism described above). The data is then copied to the destination folder.
  - Changes the files and folder permissions to give ownership of the files to the remote user.
  - Submits the job as a remote user from within the destination folder, with the proper environment variables and launching the job script associated to the EnginFrame service.

HPC Connector run requirements

For HPC Connector to work properly, you must have an AWS account and create and configure the following items.

- An Amazon S3 bucket that's used by HPC Connector for transferring the data from the spooler local to the node running the EnginFrame server to the remote clusters on AWS, or the other way around. HPC Connector doesn't support Using Amazon S3 bucket keys.
- An IAM role for accessing the Amazon S3 bucket. This role is used by HPC Connector for transferring the data back and forth the remote destination.
- An IAM role for managing AWS ParallelCluster in your account. This role is used by HPC Connector for creating, starting, and stopping clusters.
- An IAM role for running jobs remotely using AWS SSM. This role is used for launching job scripts remotely on the clusters.

- For EnginFrame on-premises, an IAM user for allowing HPC Connector to assume the required roles when managing clusters or launching remote jobs.

Cluster users

When launching a cluster from within HPC Connector, administrators must specify how to map users within the cluster with respect to the user launching the job. HPC Connector supports the following two different mechanisms for this.

- **Single user mode** – In this mode, any user connected to the EnginFrame portal and with access to the cluster submits jobs to the cluster as a single predefined cluster user. This mode requires administrators to specify the user name to use when creating the cluster (for example, ec2-user or ubuntu).
- **Multi-user 1:1 mode** – In this mode, any user connected to the EnginFrame portal and with access to the cluster submits jobs to the cluster as a remote cluster user with the same name.

HPC Connector does not provision or manage users on the cluster. This means that you're required to have such users already present in the cluster before submitting any job. Additionally, you might also need a mechanism to keep users in sync with your on-premises environment. HPC Connector maps the on-premises and remote users with the chosen logic. However, if the chosen user isn't available in the remote cluster, your job submissions will fail.

When requested to launch a job remotely, HPC Connector launches the job using AWS SSM. HPC Connector assumes the role of a remote user on the cluster depending on the mode. This is either the user specified when the cluster is created for single user mode or a user with the same name as the one logged in to the EnginFrame portal for multi-user mode.

Obtaining NICE EnginFrame

If you didn't already receive your NICE EnginFrame package from NICE or your EnginFrame reseller, download it from EnginFrame website.

Downloading EnginFrame

EnginFrame packages can be downloaded from the EnginFrame website.

https://www.enginframe.com

You need a valid account to access the download area. If you don't have one yet, contact `<helpdesk@nice-software.com>` or your EnginFrame reseller.

EnginFrame on Amazon EC2

You don't need a license server to install and use the EnginFrame server on an Amazon EC2 instance. The EnginFrame server automatically detects that it's running on an Amazon EC2 instance. It also periodically connects to an Amazon S3 bucket to determine if a valid license is available. Make sure that your instance can do the following:

- It can reach the Amazon S3 endpoint. If it has access to the internet, it connects using the Amazon S3 public endpoint. If your instance doesn't have access to the internet, configure a gateway endpoint for your VPC with an outbound security group rule. Alternatively, configure it with an access control list (ACL) policy that allows you to reach Amazon S3 through HTTPS. For more information, see Gateway VPC Endpoints in the Amazon VPC User Guide. If you experience any issues connecting to the S3 bucket, see Why can't I connect to an S3 bucket using a Gateway VPC endpoint? in the AWS Knowledge Center.
- It has permission to access the required Amazon S3 object. Add the following Amazon S3 access policy to the instance's IAM role and replace the Region placeholder (*region*) with your AWS Region (for example, `us-east-1`). For more information, see Create IAM Role.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": "s3:GetObject",
      "Resource": "arn:aws:s3:::enginframe-license.region/*"
    }
  ]
}
```

Access to the instance metadata must be enabled. By default, it's enabled unless you might have turned it off. You can turn it back on by using the modify-instance-metadata-options command.

If you're installing and using the EnginFrame server on an Amazon EC2 instance, you can skip the rest of this chapter. The rest of this chapter only applies to using the EnginFrame server on an on-premises server or one hosted in the cloud.

EnginFrame on on-premises and other cloud-based servers

When running on an on-premises server or one hosted in the cloud, you need a valid license to install and run EnginFrame. If you don't already have one, contact `<helpdesk@nice-software.com>` or your EnginFrame reseller.

EnginFrame licenses are classified as one of the following types:

- *Demo licenses* — demo licenses aren't bound to any IP address and are valid for one month.
- *Full licenses* — full licenses have time-unlimited validity and are bound to one or more IP addresses.
- *Year licenses* — year licenses have time-limited validity and are bound to one or more IP addresses.

Contact `<helpdesk@nice-software.com>` or your EnginFrame reseller to purchase, renew, or update a license. They can also help you can change your license or obtain a demo license.

Licensed plug-ins

When running EnginFrame on Amazon EC2, a license plugin isn't required. When running EnginFrame on an on-premises sever or one hosted in the cloud, plug-ins require a specific license to work. The standard plug-ins that are included in the EnginFrame installation. This requires that a license have the following characteristics:

- **interactive** — Enables basic functionalities for Interactive Session management.
- **applications** — Enables the Workspace.
- **hpc-support** — Enables the HPC functionalities

Additional plug-ins provided by NICE might also require a license.

The license file that's provided by your sales contact in most cases contains license components for all the plug-ins that are included in your EnginFrame bundle.

For more information, check with your NICE sales contact or our support helpdesk@nice-software.com.

If you have a specific license file, it must be copied under `$EF_TOP/license` folder, and have an *.ef* extension.

It's automatically read by the portal. You don't need to restart EnginFrame.

Note

Remove from the `$EF_TOP/license` folder any older *.ef* license files that contain expired licenses or licenses that aren't correct. You want to do this because EnginFrame doesn't accept any license conflict.

The following is an example license for the *Interactive* component.

```
<?xml version="1.0"?>

<ef-licenses>
<ef-license-group product="EnginFrame PRO" format="1.0" release="2014.0">
  <ef-license
    component="interactive"
    vendor="NICE"
    expiration="2014-12-31"
    ip="10.20.10.14"
    licensee="Acme.com"
    type="DEMO"
    units="20"
    signature="xxxxxx"
  />
</ef-license-group>
</ef-licenses>
```

For more information about EnginFrame licenses, see EnginFrame licenses.

Planning a NICE EnginFrame deployment

Setting up EnginFrame is a straightforward process. However, it's important to accurately plan your EnginFrame Portal deployment to achieve seamless integration with your computing environment and to meet the IT requirements of your organization.

Note

Starting March 31, 2022, NICE EnginFrame doesn't support VNC®, HP® RGS, VirtualGL, and Amazon DCV 2016 and previous versions.

Prerequisites

Before you deploy EnginFrame Portal, make sure that your system meets the following requirements.

Topics

System requirements

Topics

NICE EnginFrame supports the following operating systems:

- Amazon™ Linux® release 2016.03 or later
- Red Hat® Enterprise Linux® 5.x, 6.x, 7.x, 8.x (*x86-64*)
- SUSE® Linux® Enterprise Server 11 SP2, 12 SP3 (*x86-64*)

  SUSE® Linux® Enterprise Server 12 SP5 (*x86-64*)

  SUSE® Linux® Enterprise Server 15 SP2 (*x86-64*)

> **Note**
>
> Other Linux® distributions and compatible Java™ versions might work but are not officially supported. Contact `<helpdesk@nice-software.com>` for more information.

The installation machine must have at least 3 GB of RAM and one or more IP addresses. For these IP addresses, at least one of them must be reachable by each of the potential client machines. It can be reached either directly or through proxies.

To install EnginFrame, minimally you need at least 200 MB of free disk space. However, we recommend that you have as much as 2 GB or more. This is because EnginFrame while operating saves important data and logging information.

Make sure you have enough space for the service data that's stored inside the EnginFrame spoolers. By default, spoolers are located inside the EnginFrame installation directory (`$EF_TOP/spoolers`).

Additional considerations for using SUSE Linux

EnginFrame PAM standard user authentication (system) expects to find the file `system-auth` in the folder `/etc/pam.d/`. However, in SUSE® Linux® Enterprise Server, this file is called `common-auth`. So, to make the standard authentication work, a symbolic link is required: `ln -s /etc/pam.d/common-auth /etc/pam.d/system-auth`

Third-party software prerequisites

In addition to the standard packages that are installed with your operating system, NICE EnginFrame also requires some additional third-party software. This topic describes the third-party software that's required and how you can set it up.

Topics

- Java™ platform
- Database management systems
- Authentication methods
- Distributed resource managers
- Remote visualization technologies

Java™ platform

NICE EnginFrame requires the *Linux® x64* version of *Oracle® Java™ Platform Standard Edition* (Java™ SE) or the *OpenJDK Runtime Environment* . EnginFrame supports both versions 8 and 11 of these packages.

Supported Java™ vendors:

- Oracle®
- Amazon Web Services
- Red Hat®
- IcedTea

In this topic, `JAVA_HOME` is referred to as the Java™ installation directory.

The same Java™ version must be used for both EnginFrame Server and EnginFrame Agent.

Database management systems

EnginFrame requires a *JDBC-compliant* database. EnginFrame uses a relational database management system to manage *Triggers*, *Job-Cache*, and *Applications* and *Views* user groups. EnginFrame *Triggers* rely on Quartz (http://www.quartz-scheduler.org) engine to schedule EnginFrame services to run. Triggers are used internally to run periodic tasks as to check and update Interactive sessions status. They're also used to collect EnginFrame usage statistics. The *Job-Cache* feature is responsible for collecting and caching job statuses over time.

By default, Apache Derby® 10.14 database is installed together with EnginFrame Professional. However, we don't recommend using Apache Derby® in a production installation.

Apache Derby® isn't supported for EnginFrame Enterprise installations. We recommend that you use an external JDBC-compliant relational database management system (RDBMS). Because EnginFrame Enterprise is part of a high availability solution, the RDBMS that you choose to use must have its own high availability strategy. We recommend that you configure the external RDBMS on a different node or nodes than the EnginFrame servers. If possible, we also recommend that you configure it to be fault tolerant.

EnginFrame supports MySQL® Database 8.0.x and later with the InnoDB storage engine. You can also use EnginFrame with other databases, such as Oracle® Database, SQL Server®, MariaDB®. However, these databases aren't officially supported, so we don't recommend that you use them. If you encounter issues with a supported relational database management system version, contact helpdesk@nice-software.com.

EnginFrame provides the JDBC driver only for Apache Derby®. If a different DBMS is used, you must add the JDBC driver to the `$EF_TOP/<VERSION>/enginframe/WEBAPP/WEB-INF/lib` directory after you install EnginFrame.

For instructions on how to install and configure the JDBC driver, see Install and configure EnginFrame.

Authentication methods

You can use a variety of authentication methods with EnginFrame. Some of them require third-party software components.

We recommend that you consider a variety of factors when choosing an authentication method. The following table details several relevant considerations including third-party software prerequisites, if any exist. For more information, see also Supported authentication methods.

Supported authentication methods

Name	Prerequisites	Notes
PAM	Linux® PAM must be correctly configured	This is the most common authentication method. As a system administrator, you can use it to add new authentication methods by installing new PAM modules. You can also use it to modify authentic ation policies by editing the configuration files. When you install it, you're asked to specify which PAM service to use, **system-auth** is the default.
LDAP	The **ldapsearch** command must be installed and working appropriately on the EnginFrame Agent host.	You can use these authentication methods to authenticate users against an LDAP or Active Directory server. When you install these authentication methods, the EnginFrame installer asks you to specify the parameters that are required by **ldapsearch** to contact and query your directory server.
Active Directory		
HTTP Authentication	External HTTP authentication system	This authentication method relies on an external authentication system to authenticate the users. The external system then adds an HTTP authentic ation header to the user requests. EnginFrame trusts the HTTP authentication header.

Name	Prerequisites	Notes
Certificate	SSL Certificates must be installed and exchanged between EnginFrame Server and clients.	This authentication method is accomplished on the web server, which requires the client authentic ation through the use of SSL certificates.

The EnginFrame installer can optionally verify if you configured the selected authentication method.

NICE EnginFrame can be easily extended to add support for custom authentication mechanisms.

Distributed resource managers

EnginFrame supports different distributed resource managers (DRM).

When you install EnginFrame, you must specify which distributed resource managers that you want to use and provide the information that's required by EnginFrame to contact them. A single EnginFrame instance can access more than one DRM at the same time.

Supported distributed resource managers

Name	Version	Notes
IBM® Platform™ LSF®	10.1.x	The LSF client software must be installed on the EnginFrame Agent host. The installer asks you to specify the LSF profile file.
AWS HPC Connector	AWS HPC Connector requires AWS ParallelCluster version 3.0.2 or later.	The installer asks you to specify the AWS account ID, the AWS Region, the S3 bucket, and the IAM roles to use.
Altair® PBS Professio nal®, OpenPBS®	Altair® PBS Professio nal®: 19.2.x - 2020.1.x OpenPBS®: 19.1.x - 20.0.x	The OpenPBS® or PBS Professional® client software must be installed on the EnginFrame Agent host.

Name	Version	Notes
		The installer asks you to specify the directory where the OpenPBS® or PBS Professional® client software is installed.
SLURM™	19.05.x - 21.0.x	SLURM™ binaries must be installed on the EnginFrame Server host. SLURM™ master host must be reachable from the EnginFrame Server host. The installer asks you to specify the path where binaries are installed. For SLURM™ configuration, specifically related to compute nodes that are dedicated to interactive sessions, the Features: vnc,dcv,dcv2 and RealMemory parameters must be added to every required node. 'dcv2' stands for DCV since 2017.
Sun® Grid Engine (SGE)	8.1.x	The Grid Engine client software must be installed on the EnginFrame Agent host. The `$SGE_ROOT/$SGE_CELL/common` must be shared from SGE master to EF nodes. The installer asks you to specify the Grid Engine shell settings file.
Univa® Grid Engine® (UGE)	8.6.x	
Son of Grid Engine (SoGE)	8.1.x	
AWS Batch	The AWS Batch cluster must be created with AWS ParallelCluster 3.x (3.0.0 or later) and AWS ParallelCluster Batch CLI 1.0.0 must be installed.	The installer asks you to specify the AWS ParallelCluster cluster name, the AWS Region, the local AWS profile, and the IAM role to use to interact with AWS.

By default, some schedulers such as PBS Professional® and Univa® Grid Engine® (UGE) 8.2.0 have job history disabled. This means that a job disappears when finished. We recommend that you configure these distributed resource managers to retain information about the finished jobs. For more information, see Required DRM configuration.

Note

Starting March 31, 2022, NICE EnginFrame doesn't support VNC®, HP® RGS, VirtualGL, and Amazon DCV 2016 and previous versions.

Required DRM configuration

AWS HPC Connector

For information, see Requirements for running HPC Connector.

Altair® PBS Professional®

Applies to versions: 11, 12, 14

By default, Altair® PBS Professional® doesn't show finished jobs. To enable job history, a server parameter must be changed: `qmgr -c "set server job_history_enable = True"`

After it's enabled, the default duration of the job history is 2 weeks.

Univa® Grid Engine® (UGE)

Applies to versions: 8.2.x.

Univa® Grid Engine® (UGE) by default does not show finished jobs. To enable job history, follow these steps:

- *(8.2.0 only)* disable reader threads:

  Edit file `SGE_ROOT/SGE_CELL/common/bootstrap`.

  Set `reader_threads` to 0 instead of 2.
- Enable finished jobs:

  Run the `qconf -mconf` command.

  Set `finished_jobs` to a non-zero value according to the rate of finishing jobs.

The `finished_jobs` parameter defines the number of finished jobs stored. If this maximum number is reached, the oldest finished job is discarded for every new job that's added to the finished job list.

By default, EnginFrame grabs the scheduler jobs every minute. The `finished_jobs` parameter must be tweaked so that a finished job stays in the job list for at least a minute. Depending on the number of jobs that are running in the cluster a reasonable value is in between *the medium number of running jobs* and *the amount of jobs ending per minute*.

- Run the `restart qmaster` command.

SLURM™

Applies to versions: all.

SLURM™ shows finished jobs for a default period that's defined by the `MinJobAge` parameter in the `slurm.conf` file. It's under `/etc/slurm` or the SLURM™ configuration directory. The default value is *300* seconds (five minutes).

If you changed this parameter, ensure it's not set to a value lower than 300.

Check the `MaxJobCount` parameter isn't set.

After changing this parameter restart SLURM™ by running the `/etc/init.d/slurm stop /etc/init.d/slurm start` command.

You must set this setting on all SLURM™ nodes.

IBM® Platform™ LSF®;

Applies to versions: all.

IBM® Platform™ LSF® shows finished jobs for a default period that's defined by the `CLEAN_PERIOD` parameter in the `lsb.params` file. The default value is 3600 seconds (one hour).

If you changed this parameter, ensure it's not set to a value lower than 300.

After changing this parameter, run the `badmin reconfig` command.

AWS Batch

To integrate EnginFrame with AWS Batch, create an AWS Batch cluster with AWS ParallelCluster and give the user that's to run the EnginFrame server permission to interact with the cluster. To do this, follow these steps.

- Install AWS ParallelCluster and configure it. For more information, see Setting up AWS ParallelCluster in the *AWS ParallelCluster User Guide*.

  As a part of the setup process, AWS CLI is installed as dependency of AWS ParallelCluster.
- Install AWS ParallelCluster AWS Batch CLI 1.0.0. It's distributed on PyPi as `aws-parallelcluster-awsbatch-cli`.
- Create a new cluster for the AWS Batch scheduler. Make sure that, when you create the cluster, you take into account the network requirements for AWS ParallelCluster with AWS Batch scheduler.
- In the IAM console create a user *MY_USER* with the following policy:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": "sts:AssumeRole",
      "Resource": "<MY_ROLE_ARN>"
    }
  ]
}
```

  For this policy, replace *<MY_ROLE_ARN>* with the ARN of the role that you create in the next step. Keep note of the User credentials because you're going to use them later.
- In the IAM console, create a role *MY_ROLE* that uses the policies "Base user policy" and "Additional user policy" when using AWS Batch scheduler". For more information, see AWS Identity and Access Management roles in AWS ParallelCluster in the *AWS ParallelCluster User Guide*. In addition, also include the following trust relationship.

```
{
  "Version":"2012-10-17",
  "Statement":[
    {
      "Effect":"Allow",
       "Action": "sts:AssumeRole",
       "Principal": {
         "AWS": "<MY_USER_ARN>"
       }
    }
  ]
}
```

Replace *MY_USER_ARN* with the ARN of the user that you created on the preceding step.

- Create a dedicated AWS profile with name *MY_PROFILE* to use with the AWS CLI for the user running the EnginFrame Server (for example, *efnobody*) and configure it to use the credentials of *MY_USER*.

```
[efnobody]$ aws configure --profile MY_PROFILE
```

- Follow EnginFrame installer steps to configure AWS Batch EnginFrame plugin to contact the created cluster.
- When upgrading to EnginFrame 2021.x, add the following lines in `$EF_CONF_ROOT/plugins/awsbatch/ef.awsbatch.conf` config file after it's upgraded the release with the installer:

```
# AWS profile that the AWS Batch plugin should use to interact with AWS
AWSBATCH_PROFILE=<MY_PROFILE>

# AWS IAM role ARN that the AWS Batch plugin should use to interact with AWS
Batch
AWSBATCH_ROLE_ARN=<MY_ROLE_ARN>
```

Replace *MY_PROFILE* and *MY_ROLE_ARN* with the specific ones that you created in the preceding steps.

Remote visualization technologies

EnginFrame supports different remote visualization technologies, and the same EnginFrame instance can manage more than one of these visualization technologies. The following table lists the supported ones.

Supported remote visualization technologies

Name	Version	Notes
Amazon DCV	2017.x or later	You can use it to share sessions both in full access or view only mode.
Amazon DCV Session Manager		For more information, see the Amazon DCV Session Manager documentation

For instructions on how to install and configure these remote visualization technologies, see their respective manuals.

Note

Starting March 2022, EnginFrame doesn't support TurboVNC, in favor of Amazon DCV Session Manager. Customers using versions of EnginFrame released after March 2022 will be unable to use TurboVNC for accessing interactive sessions.

Remote visualization technologies configuration

Amazon DCV 2017.0 or later on Linux

For Linux environments, the authentication configuration to use with Amazon DCV must correspond to the authentication system that's set on the Amazon DCV server in the remote visualization hosts.

On EnginFrame, the authentication to use with Amazon DCV on Linux can be set in the `INTERACTIVE_DEFAULT_DCV2_LINUX_AUTH` configuration parameter that's in the `$EF_TOP/conf/plugins/interactive/interactive.efconf` file.

The default value and documentation can be found in the static configuration file that's named `$EF_TOP/<VERSION>/enginframe/plugins/interactive/conf/interactive.efconf`.

The `auto` authentication system provides seamless authentication with self-generated strong passwords. It requires the following configuration on the visualization hosts that are running the Amazon DCV server.

- Make sure that the Amazon DCV simple external authenticator that's provided with Amazon DCV is installed and running.

  The simple external authenticator installation package is distributed as an rpm (for example, `nice-dcv-simple-external-authenticator-2017.x...x86_64.rpm`).

  After it's installed, you can manage the service as `root` user:

  - On systems using `SystemD` (for example, RedHat 7):

    ```
    $ systemctl [start|stop|status] dcvsimpleextauth
    ```

  - On systems using `SysVInit` (for example, RedHat 6):

    ```
    $ /etc/init.d/dcvsimpleextauth [start|stop|status]
    ```

- You must configure the Amazon DCV server to use the simple external authenticator instance that's named `dcvsimpleextauth` to run on the same host. For example, configure it to run by editing the `/etc/dcv/dcv.conf` file, under the `security` section as follows:

  ```
  [security]
  auth-token-verifier="http://localhost:8444"
  ```

- Restart the Amazon DCV server after changes were made to the `/etc/dcv/dcv.conf` configuration file.

Amazon DCV 2017.0 or later on Windows

For Windows environments the authentication configuration used with Amazon DCV must be configured on EnginFrame in the `INTERACTIVE_DEFAULT_DCV2_WINDOWS_AUTH` configuration parameter. This is in the `$EF_TOP/conf/plugins/interactive/interactive.efconf` file.

Default value and documentation can be found in the `$EF_TOP/<VERSION>/enginframe/plugins/interactive/conf/interactive.efconf` static configuration file.

The `auto` authentication system provides seamless authentication with self-generated strong passwords. It doesn't require any other configuration on the visualization hosts that are running the DCV server.

The DCV server service is managed by the interactive session job landing on the node:

- If the Amazon DCV server service is not running, it's started.
- If the Amazon DCV server service is running but with different authentication configuration than the one set on the EnginFrame side, the configuration is changed and the service restarted. This is also the case if the DCV server is configured to launch the console session at system startup. This setting is removed by the interactive session job.
- If the Amazon DCV session is running but there's no logged user, the session is closed by the interactive session job.

Network requirements

EnginFrame is a distributed system. Your network and firewall configuration must allow EnginFrame components to communicate with each other and with user browsers.

The specific requirements depend on how EnginFrame is deployed on your system. The following table summarizes network requirements for a basic EnginFrame deployment.

Network requirements

Port (default)	Protocol	From host	To host	Mandatory
8080/8443	HTTP/HTTPS	User's clients	EnginFrame Server	Mandatory
9999 and 9998	RMI (TCP)	EnginFrame Server	EnginFrame Agent	Optional
8080/8443	HTTP/HTTPS	EnginFrame Agent	EnginFrame Server	Optional †
7800	TCP	EnginFrame Server	EnginFrame Server	Mandatory only for EnginFrame Enterprise ‡

† Required if EnginFrame Agent and EnginFrame Server run on separate hosts

‡ EnginFrame Servers use the port to communicate with each other

Supported browsers

NICE EnginFrame produces HTML that can be viewed with most popular browsers. NICE EnginFrame was tested with the browsers that are listed in Supported browsers.

Supported browsers

Name	Version	Notes
Microsoft® Edge	41 and 44	
Microsoft® Internet Explorer®	10 and 11 (Will be discontinued)	
Mozilla Firefox®	3.6 and later	
Apple® Safari®	6.0 and later and iOS 6 version	Tested on Mac® OS X® and iPad® only.
Google™ Chrome™	25 and later	

JavaScript® and Cookies must be enabled on browsers.

By the end of December 2021, we will discontinue support for Internet Explorer 10. Then, at the end of June 2022, we will discontinue support for Internet Explorer 11.

Interactive Plugin requirements

Interactive Plugin requires the following components to be successfully installed and configured:

- At least one supported resource manager software or a session manager. For more information, see Distributed resource managers and Session Managers.
- At least one supported remote visualization middleware. For more information, see Remote visualization technologies.

When running EnginFrame on an Amazon EC2 instance, you can use the Interactive Plugin without a license. When running on an on-premises or alternative cloud-based server, you need a license that's installed on the EnginFrame Server.

Make sure that each node that's running interactive sessions has all the necessary software installed. On Linux®, this usually means the packages for the desired desktop environment, such as gnome, kde, or xfce.

In addition, install the following software make it available in the system PATH on visualization nodes. When you do this, the portal can show screen thumbnails in the session list.

- Linux®: *ImageMagick tool* (http://www.imagemagick.org) and the `xorg-x11-apps, xorg-x11-utils` packages
- Windows®: *NICE Shot tool* (`niceshot.exe`, available under `$EF_TOP/<VERSION>/enginframe/plugins/interactive/tools/niceshot`).

Session Managers

Starting from version 2020.0, EnginFrame supports Amazon DCV Session Manager as Session Broker.

When you install EnginFrame, you can choose to use Amazon DCV Session Manager as session broker. Then, provide the configuration parameters that are required by EnginFrame to contact the remote Amazon DCV Session Manager Server.

Single application desktop requirements (Linux®)

In some workflows, you might want to run a minimal session on your interactive nodes consisting in a minimal desktop and a single application running. For this use case, instead of installing a full desktop environment such as GNOME or KDE, we recommend that you only install the required tools. The required tools are a Window manager, a dock panel, and any of the applications that you intend to use.

In this example scenario, you can configure the `minimal.xstartup` script to be a Window Manager choice for the Applications and Views service editors.

Here is a reference list of the tools that the `minimal.xstartup` file uses. The file is provided by EnginFrame under `$EF_TOP/<VERSION>/enginframe/plugins/interactive/conf`.

- **basic tools:** `bash`, `grep`, `cat`, `printf`, `gawk`, `xprop`

- **window managers:** `metacity`, `kwin` (usually provided by package `kdebase`), `xfwm4`
- **dock panels:** `tint2`, `fluxbox`, `blackbox`, `mwm` (usually provided by package `openmotif` or `lesstif` or `motif`)

Shared file system requirements

Depending on the deployment strategy, EnginFrame might require some directories to be shared between the cluster and EnginFrame nodes. This guide covers a scenario where both EnginFrame Server and EnginFrame Agent run on the same host. For more complex configurations or to change the mount points of the shared directories, see the *"Deployment Strategies"* section in the EnginFrame Administrator Guide.

In this scenario the EnginFrame Server, EnginFrame Agent and visualization nodes might require the `$EF_TOP/sessions` directory to be shared. To check if you need to share this directory, see the following table.

Shared File System Requirement

Distributed Resource Manager	Linux®	Windows®
IBM® Platform™ LSF®	Not required	-
SLURM™	Required	-
Altair® PBS Professional®	Required	-
Grid Engine (SGE, SoGE, OGE, UGE)	Required	-

EnginFrame Enterprise system requirements

This topic lists the hardware and software prerequisites for an EnginFrame Enterprise installation.

Shared file system

The suggested and supported approach to EnginFrame Enterprise deployment involves a shared file-system for the whole $EF_TOP directory tree. Using this approach, you can install and manage the software from just one node, and all the binaries and data directories, such as the spoolers, sessions, and license, are shared among the installation nodes. High-Availability of the Shared File System is consistent with the overall HA/Disaster Recovery strategy.

The NFS `no_root_squash` or equivalent feature must be active to allow the correct management of permissions and ownership of deployed files.

We recommend that you enable on the shared file system the NFS `no_wdelay` or equivalent feature (server-side) to minimize the file writing delay between clients.

Network load balancing

To ensure automated load balancing and high availability for the EnginFrame services, it's necessary to set up a network load balancer that dispatches users' requests to the EnginFrame Servers in a balanced way.

EnginFrame requires the load balancer to implement a *sticky session* strategy. There are many open-source and commercial solutions to implement a network load balancer.

For examples of Apache® frontend configurations, see Installing a third-party Load Balancer.

Deployment strategies

Decide how to deploy NICE EnginFrame on your system.

As described in Architectural overview, EnginFrame consists of two main software components: the EnginFrame Server and the EnginFrame Agent.

You can deploy these two components on the same host or on different hosts that communicate across the network. We recommend that you deploy them based on the specifics of your computational resources organization, your network architecture, and your security and performance requirements. In addition, before you deploy them, make sure that the following requirements are met.

- EnginFrame Server host must be reachable by HTTP or HTTPS by the clients and the EnginFrame Agents.
- EnginFrame Agent host must have access to your computational resources and your grid infrastructure (for example, to submit jobs to your scheduler).
- EnginFrame Server and EnginFrame Agent must be installed on a shared storage area.
- For the interactive sessions, EnginFrame Server and EnginFrame Agent must have read and write access to a storage area shared among them and with the visualization nodes.

If both EnginFrame Server and EnginFrame Agent run on the same host, communication between the two is reliable and minimizes administration efforts. We recommend you use this deployment strategy if you have multiple EnginFrame installations on different hosts and on each of the hosts you install both an EnginFrame Server and Agent. We recommend this deployment strategy for enterprise-level deployments. For more information, see Deployment. Make sure that the EnginFrame Servers can communicate with each other.

Depending on your specific use case, you might want to install EnginFrame Server and EnginFrame Agent on separate hosts. For example, you can run the EnginFrame Server in DMZ and EnginFrame Agent on the head node of your cluster. For this deployment scenario, make sure that the following conditions are met.

- The Agent and Server must be able to communicate through a TCP connection using the Java™ RMI protocol. The relevant TCP ports that are `9999` for RMI Registry and `9998` for Remote Object, must be free on the Agent's host and reachable from the Server host.
- The Agent and Server must be able to communicate through a TCP connection using the HTTP or the HTTPS protocol. By default, the relevant TCP port is `8080/8443` for HTTP/HTTPS, respectively, on the Server's host must be reachable from the Agent host.
- The Agent and Server must be installed on a shared storage area.
  - The spoolers directory must reside on a storage area to meet the requirements that are described in the "Spoolers Requirements" section of the *EnginFrame Administrator Guide*.
  - The sessions directory must reside on a storage area to meet the requirements that are described in EnginFrame System requirements.

If you need to access the system through a DMZ, you can use an Apache® web server as frontend in the DMZ when EnginFrame is deployed on the intranet. With EnginFrame Enterprise, you can additionally use an Apache® server as network load balancer in front of a battery of EnginFrame Servers. Make sure that the EnginFrame Server is behind the Apache® Web Server that forwards all the EnginFrame requests to the Tomcat® servlet container of the EnginFrame deployment. For more information, see Apache®-Tomcat® connection.

By default, EnginFrame uses Java RMI over SSL between the Server and Agent. You can set up Tomcat® when you install EnginFrame to use HTTPS. Alternatively, you can also enable HTTPS after you install EnginFrame. For instructions, see Configuring HTTPS.

Installation directories

The *installation directory* is the location, hereafter referred to as `$NICE_ROOT`, where EnginFrame binaries, configuration files, and logs are placed.

When you install EnginFrame, the following directory structure is created under $NICE_ROOT.

```
NICE_ROOT
`-- enginframe
    |-- 2021.0-rXXXXX
    |   `-- enginframe
    |-- current-version
    |-- bin
    |   `-- enginframe
    |-- install
    |   `-- 2021.0-rXXXXX
    |-- license
    |   `-- license.ef
    |-- conf
    |   |-- enginframe.conf
    |   |-- enginframe
    |   |   |-- certs
    |   |   |-- server.conf
    |   |   `-- agent.conf
    |   |-- tomcat
    |   |   `-- conf
    |   |      `-- certs
    |   |-- derby
    |   |   |-- derby.properties
    |   |   `-- server.policy
    |   `-- plugins
    |-- data
    |   |-- cache
    |   |-- derby
    |   |   `-- EnginFrameDB
    |   `-- plugins
    |-- logs
    |   `-- <HOSTNAME>
    |       |-- *.log
    |       |-- tomcat
    |       `-- derby
    |-- repository
    |-- sessions
    |-- spoolers
    `-- temp
        `-- <HOSTNAME>
            |-- dumps
            |-- errors
```

```
                `-- tomcat
```

The following names are used in this guide to refer to the different parts of the EnginFrame installation tree.

NICE_ROOT

The directory that contains all the NICE products. By default, this directory is named `/opt/nice`.

EF_TOP

The directory that contains the EnginFrame product. By default, this directory is named `NICE_ROOT/enginframe`.

EF_LICENSE_PATH

The directory that contains the EnginFrame license files. By default, it's named `EF_TOP/license`.

EF_CONF_ROOT

The directory that contains the EnginFrame configuration files. By default, it's named `EF_TOP/conf`.

EF_DATA_ROOT

The directory that contains the data files. By default, it's named `EF_TOP/data`.

EF_LOGS_ROOT

The directory that contains the log files. By default, it's named `EF_TOP/logs`.

EF_TEMP_ROOT

The directory that contains the temporary files. By default, it's named `EF_TOP/tmp`.

Note

If you're using or planning to use the AWS HPC Connector plugin, make sure that `EF_TEMP_ROOT` points to a folder on a file system that's shared among the EnginFrame nodes.

EF_REPOSITORYDIR

The directory that contains the EnginFrame repository files. By default, it's named `EF_TOP/repository`.

EF_SPOOLERDIR

The directory that contains the EnginFrame spoolers. By default, it's named `EF_TOP/spoolers`.

INTERACTIVE_SHARED_ROOT

The directory that contains the EnginFrame interactive sessions. By default, it's named `EF_TOP/sessions`.

EF_ROOT

The directory that contains the EnginFrame binaries and system files. By default, it's named `EF_TOP/<VERSION>/enginframe`.

⚠ The `PAM` based authentication method that's included with EnginFrame requires that some binaries have the `suid` bit set to interact with the underlying system to authenticate users. If you plan to use this authentication method, make sure that the file system that hosts EnginFrame is mounted with `nosuid` flag unset.

The *EF_SPOOLERDIR directory* is used to hold all the data that's supplied as input and created as output by EnginFrame services.

As already mentioned, the spooler directory *must* be accessible by both the EnginFrame Server and EnginFrame Agent. It must be readable and writable by unprivileged users (described in the following sections) and by the `root` user.

By default, the spooler directory is placed in a subdirectory of the installation directory.

Managing spoolers contains a detailed description of the system requirements for the spoolers directory.

Special users

Choose which *system accounts* EnginFrame uses.

The EnginFrame Administrator is a special system account that has some privileges, such as having access to the EnginFrame Operational Dashboard and some of the configuration files. This account is referred to as `EF_ADMIN`.

Another special account is used to run Tomcat®. This account is referred to as `EF_NOBODY`. Make sure that all of the configuration files, along with files in the `$EF_TOP/logs` directory, are owned by `EF_NOBODY` since they might contain sensitive information. Other users or groups should not be granted permissions to these files.

Any existing system account *excluding* `root` can be specified. However, we recommend that you set up two new dedicated users for these roles.

In most cases, `efadmin` and `efnobody` are respectively used for `EF_ADMIN` and `EF_NOBODY`.

> `EF_ADMIN` and `EF_NOBODY` must be operating system valid accounts. That is, you must be able to log in to the system with those accounts, and they *must not* be disabled.

Authentication

Last, before installing EnginFrame, select an authentication method to use.

EnginFrame can authenticate users using many different mechanisms, including PAM, LDAP, ActiveDirectory, and HTTP Basic Authentication with certificates.

If the authentication methods included with EnginFrame don't meet your requirements, you can create your own authentication module.

For more information about configuring authentication, see Authentication framework.

Digital Rights Management (DRM) configuration for Interactive Plugin

The following sections describe the additional requirements for the Interactive Portal.

> **Important**
>
> EnginFrame periodically checks the status of the interactive jobs using the `EF_ADMIN` user account.
> This account must be able to access information from all of the Digital Rights Management (DRM) mechanisms, such as jobs, files and folder resources.

To make sure that this account can access this information, make sure that this account serves as one of your resource manager administrators and has administrator permissions granted.
If you don't configure this account accordingly, you might lose some interactive session data.

Note

When the resource manager controls mixed Windows® clusters, Interactive Plugin submits interactive session jobs on Windows® hosts as the user running EnginFrame Server (`efnobody` by default). This user must be a valid Windows® user.

Note

Starting March 31, 2022, NICE EnginFrame doesn't support VNC®, HP® RGS, VirtualGL, and Amazon DCV 2016 and previous versions.

IBM® Platform™ LSF®

Interactive Plugin relies on the LSF® workload manager, to allocate and reserve resources to run the interactive sessions. Interactive Plugin requires some specific LSF® settings.

The following is the configuration steps that are necessary to run Interactive Plugin sessions on your LSF® cluster. If needed, they can be enhanced or combined with your existing LSF® configuration to achieve more complex resource sharing policies.

Configuring Queues

Interactive Plugin uses resource manager's queues to submit and manage interactive sessions. You can set up Interactive Plugin to use a default queue and set different services to use different queues. However, it's important that the queues that are used for any visualization middleware or target system have the following settings:

- The EnginFrame Administrator account (usually `efadmin`) must be queue administrator of any queue used by Interactive Plugin.

- Queues for HP® RGS sessions need to have `HJOB_LIMIT` set to one, since only one HP® RGS session can run on each host.
- Queues for HP® RGS Linux® sessions need to have `PRE_EXEC` and `POST_EXEC` respectively set to the `rgs.preexec.sh` and `rgs.postexec.sh` scripts, located under `$EF_TOP/<VERSION>/enginframe/plugins/interactive/tools` folder.

Here is a configuration snippet for these queues in `lsb.queues`. You might not need to have all of these queues configured. You can adapt the parameters as you want, given the preceding requirements.

```
Begin Queue
QUEUE_NAME          = int_linux
PRIORITY            = 50
EXCLUSIVE           = y
NEW_JOB_SCHED_DELAY = 0
JOB_ACCEPT_INTERVAL = 0
ADMINISTRATORS      = efadmin
HOSTS               = viz1 vizlin01 vizlin02
DESCRIPTION = Queue for linux interactive applications
End Queue

Begin Queue
QUEUE_NAME          = rgs_linux
PRIORITY            = 50
EXCLUSIVE           = y
NEW_JOB_SCHED_DELAY = 0
JOB_ACCEPT_INTERVAL = 0
HJOB_LIMIT          = 1
ADMINISTRATORS      = efadmin
HOSTS               = viz2 vizlin03 vizlin04
PRE_EXEC = /opt/nice/enginframe/plugins/interactive/tools/rgs.preexec.sh
POST_EXEC = /opt/nice/enginframe/plugins/interactive/tools/rgs.postexec.sh
DESCRIPTION = Queue for RGS linux sessions
End Queue
```

Last, the pre-run and post-run scripts for HP® RGS Linux® sessions must run as `root`. This means that the `/etc/lsf.sudoers` file on all the LSF® nodes must contain the following line: `LSB_PRE_POST_EXEC_USER=root`

Note

Make sure `/etc/lsf.sudoers` is owned by `root` and has permissions 600. Otherwise, LSF® ignores its contents.
After you modify `/etc/lsf.sudoers`, you must run `badmin hrestart all` to restart `sbatchd` on all nodes in the cluster.

Note

To specify the default rgs queues inside interactive, edit the `$EF_TOP/conf/plugins/interactive/interactive.efconf` file and add the following two lines.

```
INTERACTIVE_DEFAULT_RGS_LINUX_QUEUE=rgs_linux
INTERACTIVE_DEFAULT_RGS_WINDOWS_QUEUE=rgs_windows
```

Important

By default, every pre-run and post-run script runs with the credentials of the owner of the job. After this configuration is applied, all the pre-execution and post-execution scripts configured in LSF® at queue level (`lsb.queues`) or at application level (`lsb.applications`) run with the root account. The impact on security and functionality must be analyzed case by case.
Alternatively, it's also possible to configure the **sudo** command to run pre-execution and post-execution scripts as a normal user with privileges to run as `root` only specific operations.

Requirements on scheduler tools

To operate with interactive sessions on the target operating systems, EnginFrame relies on some tools provided by LSF®. The scheduler must then be properly configured to make these tools work effectively on the hosts of the cluster.

The following is a list of LSF® tools that are required by EnginFrame.

- Linux® sessions via LSF® require `lsrun`.

Important

In the recent LSF® versions (specifically, 9.1 and later), the `lsrun` command is disabled by default. This configuration can be changed by editing file `LSF_TOP/conf/lsf.conf` and setting `LSF_DISABLE_LSRUN=N`. After this change, the LIM daemon must be asked to reload the configuration, as scheduler administrator running the following command: `lsadmin reconfig`

PBS Professional®

Interactive Plugin relies on the PBS Professional® workload manager, to allocate and reserve resources to run the interactive sessions. Installation and configuration instructions for PBS Professional® are out of the scope of this document. However, Interactive Plugin requires some specific PBS Professional® settings.

Here is a minimal configuration needed to run Interactive Plugin sessions on your PBS Professional® cluster. If needed they can be enhanced or combined with your existing PBS Professional® configuration to achieve more complex resource sharing policies.

Configuring Queues

Interactive Plugin uses resource manager's queues to submit and manage interactive sessions. You can set up Interactive Plugin to use a default queue and set different services to use different queues. However, it's important that the queues used for any visualization middleware or target system have the following settings:

- The EnginFrame Administrator account (usually `efadmin`) must be able to see, start, and stop jobs of any queue used by Interactive Plugin.
- You must force the limit of one job per host for HP® RGS queues, because only one HP® RGS session can run on each host.
- Queues for HP® RGS Linux® sessions must have `prolog` and an `epilog` respectively set to the `rgs.preexec.sh` and `rgs.postexec.sh` scripts, located under `$EF_TOP/<VERSION>/enginframe/plugins/interactive/tools` folder. So you might want to copy or link them into `${PBS_HOME}/mom_priv` of each execution host.

The following is an example configuration of the `interactive` queue.

```
# qmgr
Max open servers: 49
Qmgr: create queue interactive
set queue interactive queue_type = Execution
set queue interactive resources_default.arch = linux
set queue interactive enabled = True
set queue interactive started = True
```

SGE, Son of Grid Engine (SoGE), or Univa® Grid Engine® (UGE)

Interactive Plugin relies on the SGE workload manager, to allocate and reserve resources to run the interactive sessions. Installation and configuration instructions for SGE are out of the scope of this document. However, Interactive Plugin requires some specific SGE settings.

Here is a minimal configuration needed to run Interactive Plugin sessions on your SGE cluster. If needed they can be enhanced or combined with your existing SGE configuration to achieve more complex resource sharing policies.

Configuring queues

Interactive Plugin uses resource manager's queues to submit and manage interactive sessions. You can set up Interactive Plugin to use a default queue and set different services to use different queues. However, it's important that the queues that are used for any visualization middleware or target system have the following settings.

- The EnginFrame Administrator account (usually `efadmin`) must be queue administrator of any queue used by Interactive Plugin.
- To make the necessary system command line tools and environment available to Interactive Plugin scripts, SGE queues must be configured as follows:
  - The `shell_start_mode` queue parameter has to be set to `unix_behavior`.
  - If the `shell_start_mode` parameter is set to `posix_compliant`, then the `shell` parameter must be set to `/bin/bash`.
- You must force the limit of one job per host for HP® RGS queues, because only one HP® RGS session can run on each host.
- Queues for HP® RGS Linux® sessions must have `prolog` and an `epilog` respectively set to the `rgs.preexec.sh` and `rgs.postexec.sh` scripts, located under `$EF_TOP/<VERSION>/enginframe/plugins/interactive/tools` folder. They must also be run as root, because HP® RGS must operate on runlevels. Therefore, you might want to have `prolog root@/`

`path/to/enginframe/plugins/interactive/tools/rgs.preexec.sh` in the queue configuration.

SLURM™

In this scenario, Interactive Plugin relies on SLURM™ Workload Manager to allocate and reserve resources to run the interactive sessions.

Interactive Plugin requires that features vnc, dcv, dcv2 are defined in the SLURM™ configuration and that every allowed user must be able to check the status and query all SLURM™ jobs and partitions (alias queues). 'dcv2' stands for DCV since 2017.

Also, Interactive Plugin requires that the RealMemory (in MB units) parameter is defined in the SLURM™ configuration for every execution node to show the correct maximum value of memory.

Installing NICE EnginFrame

Note

Starting March 31, 2022, NICE EnginFrame doesn't support VNC®, HP® RGS, VirtualGL, and Amazon DCV 2016 and previous versions.

EnginFrame is distributed with an installer that guides you through how to install it. The installer is the EnginFrame package itself. For instruction on how to get your EnginFrame package, see Downloading EnginFrame.

Installing

You can use a graphical and a text-based installer. If you're installing on machines where you don't have access to an X Window System, we recommend that you use a text-based installer.

Unprivileged User Installation

In most cases, we recommend that you install EnginFrame as `root` user.
Installation as an unprivileged user is possible, but has the following limitations:

- You can't use authentication mechanisms that require `root` privileges (for example, PAM).

- After the installation, services are run by the user that installed EnginFrame Agent.

Make sure that the umask is 022 before launching the installation commands.

If Java™ is available in your `PATH`, start the graphical installer as `root` user:

```
# java -jar enginframe-2021.0.x.y.jar
```

The graphical installer guides you through the installation process. If the X Window System isn't available, the installer falls back to the text-based one.

Start the user interface of the text-based installer by specifying `text` argument on the command line interface:

```
# java -jar enginframe-2021.0.x.y.jar --text
```

The installer shows you the terms of the license agreement. If you aren't installing EnginFrame on an Amazon EC2 instance, it also prompts you for a valid license file. If you don't have a valid license file, see EnginFrame on on-premises and other cloud-based servers.

Note

The license file is used to determine if the product type of the EnginFrame installation is *PRO* or *ENT*. Because EC2 EnginFrame doesn't use a license file, you can determine the product type in one of two ways:

- If you're upgrading from an older installation that used a license file, that license is checked. The check determines if the installation is *PRO* or *ENT*. It does this before moving the license file to the backup directory.
- If it's a clean EnginFrame installation, then you're prompted to choose between a *PRO* and *ENT* installation.

In either case, a field that's called *ef.product* with the value of *PRO* or *ENT* is written in the `$EF_TOP/conf/enginframe/server.conf` config file.

The installer prompts you with some questions to tailor the EnginFrame deployment to your needs.

After asking all the questions, the installer shows you a summary of your answers. This is when you can change values before installing. After summary is accepted, the installer proceeds to set up EnginFrame on current host.

Note

When installing using a Java™ Runtime Environment the following warning might appear in the output: `Unable to locate tools.jar. Expected to find it in [...]` This warning is harmless and can be safely ignored.

After installation finishes, you can begin to use EnginFrame. To learn how you can get started with your EnginFrame Portal and test your installation, see Running NICE EnginFrame.

A file that's named `efinstall.config` is saved in the directory where you launched the installer from. This file contains the options that you specified during installation. This file can be useful to document how you installed EnginFrame. You can use this information to replicate installation in *batch* mode without requiring user interactions.

Distributed Deployment

If you want to run Server and Agent on different hosts, launch the installer on the Server host and select a shared installation directory. The installer asks if the Server and Agent run on different hosts.

Batch Installation

When using batch installation, you can replicate an installation on different hosts taking as input a configuration file that's created during a normal install. To run the EnginFrame installer in batch mode, run the following command.

```
# java -jar enginframe-2021.0.x.y.jar --batch -f efinstall.config
```

If you didn't specify the `-f` option, the installer searches for a file that's named `efinstall.config` in the current directory.

Unless errors occur, EnginFrame installer completes the installation procedure without requiring further user input.

Fine-tuning your installation

We recommend that you consider fine-tuning your installation. You can make adjustments to make sure that your installation of EnginFrame is performing optimally on your system and meets your specific requirements.

Topics

- Spooler download URL
- Optimizing JDK options
- Distributed resource manager options
- Interactive plugin

Spooler download URL

The EnginFrame Agent must communicate with EnginFrame Server when downloading a file from a spooler. In some network configurations and architectures, when a Web Server is placed if front of the EnginFrame Server, this callback URL must be explicitly configured.

If you can't download files from your EnginFrame Portal, see Configure download URL on agent for configuring EnginFrame Agent callback URL.

Optimizing JDK options

To fine tune the JVM heap size used to launch the EnginFrame Server or the EnginFrame Agent, you can modify settings in the `$EF_TOP/conf/enginframe.conf` file. You can set `SERVER_MIN_HEAP` and `SERVER_MAX_HEAP` for the EnginFrame Server, and `AGENT_MIN_HEAP` and `AGENT_MAX_HEAP` for the EnginFrame Agent.

If you want full control of the JVM options, you can set `SERVER_JAVA_OPTIONS` and `AGENT_JAVA_OPTIONS` in the `$EF_TOP/conf/enginframe.conf` file. However, note that doing so overrides *all* of the parameters, including the default ones.

In the following example, the heap size for Agent is set to 1024 MB.

```
# Initial heap memory size for the EnginFrame Agent
AGENT_MIN_HEAP='1024m'

# Max heap memory size for the EnginFrame Agent
```

```
AGENT_MAX_HEAP='1024m'
```

Distributed resource manager options

The EnginFrame installer configures the HPC Connector at installation time. You can modify the HPC Connector parameters in the AWS HPC Connector (hpc) main configuration file. It's located at `$EF_TOP/conf/plugins/hpc/hpc.efconf`. This is required as a preconfiguration step before HPC Connector can be used within your EnginFrame environment.

- `HPCC_AWS_PROFILE_NAME` — The AWS profile name that's used for creating the clusters.
- `HPCC_AWS_REGION` — The AWS Region where the clusters will be created by default.
- `HPCC_AWS_BUCKET_ARN` — The Amazon Resource Name (ARN) of the Amazon S3 bucket that's used for data exchange.
- `HPCC_SSM_ROLE_ARN` — The ARN of the IAM role that's used for invoking remote commands using SSM.
- `HPCC_S3_ROLE_ARN` — The ARN of the IAM role that's used for data exchange.
- `HPCC_PCLUSTER_ROLE_ARN` — The ARN of the IAM role that's used for creating the clusters using AWS ParallelCluster.
- `HPCC_USE_INSTANCE_PROFILE` — Set this boolean parameter to `true` if EnginFrame is installed on an Amazon EC2 instance and you want the HPC Connector to use an instance profile instead of the profile mapped to the `ef-iam-user`. The default value for this parameter is `false`. For information about how to set up an instance profile, see Using an IAM role to grant permissions to applications running on Amazon EC2 instances in the *AWS Identity and Access Management User Guide*.
- `HPCC_DELETED_CLUSTER_TTL` the time to live after which a cluster in the deleted state will be removed from the system. The time span must follow the ISO8601 duration syntax. The default value for this parameter is one day.
- `HPCC_COMPLETED_APPLICATION_TTL` the time to live after which a completed remote job is removed from the system. The time span will need to follow the ISO8601 duration syntax. The default value for this parameter is seven days.

Cluster name label

All the grid plug-ins in EnginFrame support the option to specify a custom label to be used by the portal to show the name of the clusters.

Change the grid plug-in cluster name by specifying in the plug-in configuration file the `[PLUGIN-ID]_CLUSTER_LABEL` options:

- `$EF_TOP/conf/plugins/lsf/ef.lsf.conf`: `LSF_CLUSTER_LABEL=...`
- `$EF_TOP/conf/plugins/pbs/ef.pbs.conf`: `PBS_CLUSTER_LABEL=...`
- `$EF_TOP/conf/plugins/sge/ef.sge.conf`: `SGE_CLUSTER_LABEL=...`
- `$EF_TOP/conf/enginframe/plugins/slurm/ef.slurm.conf`: `SLURM_CLUSTER_LABEL=...`

Configuring multiple clusters for the same grid manager

Currently, EnginFrame supports the multi-cluster configuration only for the Slurm plug-in.

Configure multiple Slurm clusters by specifying following options in the plug-in configuration file `$EF_TOP/conf/enginframe/plugins/slurm/ef.slurm.conf`:

- `SLURM_CLUSTER_IDS`

  Comma-separated list of IDs that are assigned to a cluster.
- `SLURM_CLUSTER_[CLUSTER-ID]_LABEL`

  (Optional) Label to display for the cluster that's identified by the `CLUSTER-ID`. `CLUSTER-ID` is used if the label isn't set.
- `SLURM_CLUSTER_[CLUSTER-ID]_CONF`

  For each cluster, the path to the configuration file of the cluster is identified by `CLUSTER-ID`.

The following is an example.

```
# Optional configuration: if not set, only the default cluster will be used,
with following settings:
#SLURM_CLUSTER_LABEL
# (optional, cluster id will be used if not set)

SLURM_CLUSTER_IDS="SLURM1,SLURM2"

# First Cluster
SLURM_CLUSTER_SLURM1_LABEL="SLURM_FIRST"
```

```
SLURM_CLUSTER_SLURM1_CONF="/efs/slurm/slurm_121/etc/slurm.conf"

# Second Cluster
SLURM_CLUSTER_SLURM2_LABEL="SLURM_SECOND"
SLURM_CLUSTER_SLURM2_CONF="/efs/slurm/slurm_123/etc/slurm.conf"
```

Important

You can't specify `SLURM_CLUSTER_LABEL` option if multiple Slurm clusters are used. You can only use clusters that are compatible with the Slurm client in the folder indicated by the `SLURM_BINDIR` option.

Interactive plugin

Distributed resource manager

The EnginFrame installer configures the Interactive Plugin depending on the resource manager selection when you install EnginFrame. If you want to change this setting, the related configuration parameters are located in the Interactive Plugin main configuration file: `$EF_TOP/conf/plugins/interactive/interactive.efconf`.

The parameters are named `INTERACTIVE_DEFAULT_LINUX_JOBMANAGER` and `INTERACTIVE_DEFAULT_WINDOWS_JOBMANAGER`. You can set their values to the following:

- `lsf` - Sessions are scheduled by LSF® (*Linux®-only*).
- `pbs` - Sessions are scheduled by PBS Professional® (*Linux®-only*).
- `sge` - Sessions are scheduled by Sun® Grid Engine, Univa® Grid Engine® (UGE) or Son of Grid Engine (SoGE) (*Linux®-only*).

You can override this behavior on per-EnginFrame service basis by using `--jobmanager` option of `interactive.submit` session starter script.

Remote visualization technology

By default, Interactive Plugin is set to use VNC® remote visualization technology. If you want to change this setting, the related configuration parameter is located in the Interactive Plugin main configuration file: `$EF_TOP/conf/plugins/interactive/interactive.efconf`.

The parameter is named `INTERACTIVE_DEFAULT_REMOTE`. You can set it to one of the following values:

- `dcv2` - To manage Amazon DCV (since 2017.0) 3D accelerated sessions.

You can override this behavior on a per-EnginFrame service basis by using the `--remote` option of the `interactive.submit` session starter script.

Installing EnginFrame Enterprise

Topics

- Installing a third-party Load Balancer
- Setting up the database management system
- Configure the EnginFrame service
- Start EnginFrame
- Saving database credentials in a keystore

Installing a third-party Load Balancer

EnginFrame Enterprise requires a load balancer implementing the *sticky session* strategy.

The following sections describe how you can implement load balancing for EnginFrame Enterprise. This implementation is based on AJP connector and Apache® Web Server frontend with `mod_proxy_balancer` module.

Topics

- Configure the AJP connector
- Configure the Apache® Proxy
- Configure the Apache® mod_proxy_balancer

Configure the AJP connector

Enable the AJP connector on Tomcat®:

- Log in as root on the node of the EnginFrame server:

```
# cd $EF_TOP/conf/tomcat/conf
```

- Open the `server.xml` file and add a section to define the AJP 1.3 connector.

```
<Connector
  port="8009"
  enableLookups="false"
  redirectPort="8443"
  protocol="AJP/1.3"
  URIEncoding="utf-8" />
```

If port 8009 is used by another application, choose another port.

Configure the Apache® Proxy

To enable Reverse Proxy Support in Apache® append the following lines to the main Apache® configuration file (`APACHE_TOP/conf/httpd.conf`) and reload the Apache® service.

```
<Location "/enginframe">
  DefaultType None
  ProxyPass        ajp://127.0.0.1:8009/enginframe flushpackets=on
  ProxyPassReverse ajp://127.0.0.1:8009/enginframe
</Location>
```

If your context isn't `enginframe`, then change the `<Location>` and those two lines accordingly.

Configure the Apache® mod_proxy_balancer

This configuration is required to balance the traffic over many EnginFrame instances.

Create a specific file (for example, `ef-ent.conf`), and add to the Apache® configuration directory. In most cases, it's `/etc/httpd/conf.d`.

The following is an example of the `ef-ent.conf` file content.

```
Header add Set-Cookie "ROUTEID=.%{BALANCER_WORKER_ROUTE}e;
path=/enginframe" env=BALANCER_ROUTE_CHANGED

<Proxy balancer://enterprise>
  BalancerMember ajp://<ip of EnginFrame Server 1>:8009 route=1
  BalancerMember ajp://<ip of EnginFrame Server 2>:8009 route=2
  ProxySet lbmethod=bybusyness
  ProxySet stickysession=ROUTEID
</Proxy>

<Location "/enginframe">
  ProxyPass        balancer://<enterprise hostname>/enginframe
  ProxyPassReverse balancer://<enterprise hostname>/enginframe
</Location>
```

The `enterprise` alias is an internal parameter. If necessary, you can change the `enginframe` context. You must set up the `Header` to store internally the route ID to pass it to `stickysession` variable, useful for automatic management of cookies.

Setting up the database management system

An empty database instance that's named `EnginFrameDB` must be created before EnginFrame first startup. `EnginFrameDB` is case sensitive. At the first startup, EnginFrame creates all the needed tables.

The following sections describe the steps to create the EnginFrameDB database instance on the supported database management system.

Note

Don't start an EnginFrame server or servers before the following steps are completed.

Topics

Install and configure EnginFrame

When installing EnginFrame Enterprise, you're asked to insert the JDBC URL to the EnginFrame database instance. You're also asked to add the username and password that you use to access it.

```
JDBC URL [default: jdbc:derby://localhost:1527/EnginFrameDB]
> jdbc:mysql://172.16.10.216:3306/EnginFrameDB
Username [default: dbadmin]
> enginframedb
Password
>
```

Configure the MySQL® database (version 5.1.x and higher)

1. Use the following command on the MySQL® server host to log in as root.

   ```
   # mysql -p
   ```

2. Create a new database by running the following SQL query for MySQL 5.x.

   ```
   # CREATE DATABASE EnginFrameDB;
   ```

   For MySQL 8.x and later, you must define a character set that isn't UTF8 due to a limitation on row length.

   ```
   # CREATE DATABASE EnginFrameDB DEFAULT CHARACTER SET latin1;
   ```

3. Create a new user by running the following SQL queries, using single quotes.

   ```
   # CREATE USER '<username>'@'<host>' IDENTIFIED BY '<password>';
   ```

   Consider the following example.

   ```
   # CREATE USER 'efdbadmin' IDENTIFIED BY 'efdbpassword';
   # CREATE USER 'efdbadmin'@'%' IDENTIFIED BY 'efdbpassword';
   ```

   The first statement allows access to localhost (for example, for maintenance actions). In the second line, `'%'` functions as a wildcard that's used to allow all hosts. You can modify the latest statement to restrict the access to the EnginFrame Servers only.

4. Grant privileges to the new user on the previously created DB by running the following SQL query.

   ```
   # GRANT ALL PRIVILEGES ON EnginFrameDB.* TO <username>
   ```

```
  IDENTIFIED BY '<password>';
```

Consider the following example.

```
# GRANT ALL PRIVILEGES ON EnginFrameDB.* TO 'efdbadmin'
  IDENTIFIED BY 'efdbpassword';
# GRANT ALL PRIVILEGES ON EnginFrameDB.* TO 'efdbadmin'@'%'
  IDENTIFIED BY 'efdbpassword';
```

5. Flush privileges to activate them on the created database:

```
# flush privileges;
```

6. Test the connection to the EnginFrameDB database. From one of the servers where the EnginFrame server instance is installed on, check the connection to the created database using MySQL® client only.

```
# mysql -h <mysql server hostname/ip address>[:<port>]
    -u <username>
    -p <password>
```

Consider the following example.

```
# mysql -h mysqlserver -u efdbadmin -p efpassword
```

This message is returned.

```
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 87653
Server version: 5.1.73 Source distribution

Copyright (c) 2000, 2013, Oracle and/or its affiliates. All rights reserved.

Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql>
```

Configure the Oracle database (10 and higher)

- Log in to the database as admin using a SQL client such as the SQuirreL SQL client, using the URI `jdbc:oracle:thin:@<hostname>:<port>:XE` (for example, `jdbc:oracle:thin:@efentserverdb:1521:XE`).
- Create a new user by running the following SQL query.

  ```
  # CREATE USER <username> IDENTIFIED BY <password>>
  ```

  The following is an example.

  ```
  #  CREATE USER enginframedb IDENTIFIED BY efdbpassword
  ```

  A new schema with name equals to the username is automatically created by the db engine. Logging into the database with the new user, the user schema is automatically used for that user.
- Grant privileges to the new user by running the following SQL query.

  ```
  # GRANT ALL PRIVILEGES TO <username>
  ```

  The following is an example.

  ```
  #  GRANT ALL PRIVILEGES TO enginframedb
  ```

  If you need to restrict some privileges for the new user, see the instructions in the Oracle database documentation. Make sure that the user has both read and write permissions on their schema.
- Change the database user profile to avoid automatic expiration, issuing the following SQL query.

  ```
  # ALTER PROFILE DEFAULT LIMIT PASSWORD_LIFE_TIME UNLIMITED;
  ```

  This sets the *no password expiration* for all the default user's profile.

Configure the SQL Server® (2012, 2008)

- Enable TCP/IP networking and remote connections.
  - Run SQL Server Configuration Manager

  - Go to `SQL Server Network Configuration > Protocols` for SQLEXPRESS
  - Make sure TCP/IP is enabled
  - Open the context menu (Right-click) on TCP/IP and select Properties
  - Verify that, under IP2, the IP address is set to the computer's IP address on the local subnet
  - Scroll down to IPAll
  - Make sure that TCP Dynamic Ports is blank
  - Make sure that TCP Port is set to 1433
- Create a new database that's named `EnginFrameDB` using the SQL Server Management Studio with default settings.
- Create a user with SQL Server® authentication using the SQL Server Management Studio (for example, create a user with a username that's `enginframedb` and a password that's `efdbpassword`).
  - Make sure the user has at least the `db_owner` role on the EnginFrameDB. Otherwise, it can't read and create tables. Check this in the Object Explore. Go to `Security > Logins`, open a content menu (right-click) on the username and choose `Properties > User Mapping` from the left panel.
  - Make sure that both the EnginFrameDB database option and the role membership option are checked (for example, have both the `db_owner` and `public` options checked).
  - (optional) To set EnginFrameDB as the default database for the user, go to `Security > Logins`, open a context menu (right-click) on the username and choose `Properties > General` from the left panel.
- Allow SQL Server® to be accessed through "SQL Server and Windows Authentication mode" and not only through "Windows authentication mode"
  - Open a context menu (right-click) on the database server instance where EnginFrameDB was created (for example, SQLEXPRESS).
  - Choose Properties, then Security, Server authentication and choose "SQL Server and Windows Authentication mode".

At this point, EnginFrame must be able to access SQL Server® database and to create tables.

Configure the EnginFrame service

The installer can configure the EnginFrame service to start at boot time on the node where it's run.

If the installation was performed on a shared file system, log in on each node and run the following command to configure the EnginFrame service to start on all other dedicated nodes.

```
# $EF_TOP/bin/enginframe host-setup --roles=server,agent --boot=y
```

This configuration starts both server and agent components at node startup.

To learn about the `host-setup` options, run the following command.

```
# $EF_TOP/bin/enginframe host-setup --help
```

Start EnginFrame

After the EnginFrame service is installed, run the following command to manually start it on every node.

```
# service enginframe start
```

Check if every database EnginFrameDB instance (MySQL®, Oracle® or SQL Server®) has been populated with EnginFrame tables.

Saving database credentials in a keystore

By default, when you're configure an external database, the database credentials are written to the `server.conf` configuration file. The option names `ef.db.admin.name` and `ef.db.admin.password` are set to the database username and password. You can save the database credentials in a keystore instead of the configuration file.

Setting up the keystore option requires that you edit the `${EF_ROOT}/enginframe/server.conf` file. The resulting file includes the following contents.

```
EF_DB_KEY_STORE_ENABLED=true
EF_DB_KEY_STORE=${EF_CONF_ROOT}/enginframe/certs/db.keystore
```

To migrate the credentials of your external database from the configuration file to the keystore:

1. Edit the `${EF_CONF_ROOT}/enginframe/server.conf` file as follows.

1. Remove the `ef.db.admin.name` and `ef.db.admin.password` entries.

   > **Note**
   >
   > Before deleting these entries, make a note of the value that they are set to. You need them for the following steps.

2. Add or modify the `EF_DB_KEY_STORE_ENABLED` entry. Set it to **`true`**.
3. Add an entry for `EF_DB_KEY_STORE=${EF_CONF_ROOT}/enginframe/certs/db.keystore`.

2. Run the following command.

   ```
   ${EF_TOP}/bin/ef-db-credentials.sh --action setDBAdmin --name name --password password
   ```

   Set *`name`* and *`password`* to the values that `ef.db.admin.name` and `ef.db.admin.password` were set to in the `${EF_CONF_ROOT}/enginframe/server.conf` file in Step 1.

3. Restart EnginFrame. For more information, see Running NICE EnginFrame.

Configure EnginFrame to work behind a network proxy

Learn how to provide the proxy information EnginFrame needs to route network calls correctly.

You'll use two java properties:

```
-Dhttp.proxyHost=PROXY HOST
-Dhttp.proxyPort=PROXY PORT
```

If the proxy is configured to work with HTTPS, use:

```
-Dhttps.proxyHost=PROXY HOST
-Dhttps.proxyPort=PROXY PORT
```

Set the properties in EnginFrame

1. **Get the java properties that EnginFrame currently uses:**

   a. Run `ps -aux` and locate the EnginFrame process that ends in `org.apache.catalina.startup.Bootstrap start`.
   b. Copy the line representing the command that launched EnginFrame and copy it to a local bash variable, such as `OPTIONS`:

      ```
      $ OPTIONS="content of copied line"
      OPTIONS_UPDATED=`echo "$OPTIONS" | tr ' ' '\n' | egrep -e '^-D' | tr '\n' ' '`
      ```

      The new variable `OPTIONS_UPDATED` has the content you need to use when you edit the `EnginFrame.conf` file.

2. **Edit the `EnginFrame.conf` file by adding the variable name `SERVER_JAVA_OPTIONS` to the end of the file and saving it:**

   ```
   # other variables defined
   ...
   SERVER_JAVA_OPTIONS="<values copied from the content of OPTIONS_UPDATED> -
   Dhttp.proxyHost=$PROXY_HOST -Dhttp.proxyPort=$PROXY_PORT"
   ```

   `PROXY_HOST` and `PROXY_PORT` are placeholders for the proxy host and proxy port.
3. **Restart the EnginFrame process.**

Running NICE EnginFrame

This chapter describes how to start and stop EnginFrame Portal and check its status. It also covers administration monitoring and self-check services.

Start or stop EnginFrame and check its status

You can control EnginFrame with the **$EF_TOP/bin/enginframe** command line script.

Run the following command to start EnginFrame:

```
# $EF_TOP/bin/enginframe start
```

Run the following command to stop EnginFrame:

```
# $EF_TOP/bin/enginframe stop
```

Note

If EnginFrame Server and EnginFrame Agent are on separate hosts, run the following command on the host that's running EnginFrame Server:

```
# $EF_TOP/bin/enginframe <start|stop> server
```

Run the following command on the host that's running EnginFrame Agent:

```
# $EF_TOP/bin/enginframe <start|stop> agent
```

Note

To start EnginFrame Enterprise, run the EnginFrame start (stop) command on each host of the EnginFrame Enterprise infrastructure that's in your deployment. For more information, see Deployment.

```
# $EF_TOP/bin/enginframe <start|stop>
```

This control script also checks EnginFrame's status:

```
# $EF_TOP/bin/enginframe status
```

The output of the previous command is as follows:

```
# /opt/nice/enginframe/bin/enginframe start

Reading EnginFrame version from: /opt/nice/enginframe/current-version
Current version: 2017.0-r41442

EnginFrame Control Script
Loading configuration from:
 - "/opt/nice/enginframe/conf/enginframe.conf"
Using EnginFrame in "/opt/nice/enginframe/2017.0-r41442"
Tomcat started.
```

```
[OK] EnginFrame Server started

[OK] EnginFrame Agent started
```

```
# /opt/nice/enginframe/bin/enginframe status
Reading EnginFrame version from: /opt/nice/enginframe/current-version
Current version: 2017.0-r41442

EnginFrame Control Script
Loading configuration from:
 - "/opt/nice/enginframe/conf/enginframe.conf"
Using EnginFrame in "/opt/nice/enginframe/2017.0-r41442"

---- Server PID Information ----
USER       PID  PPID %CPU %MEM STIME     TIME COMMAND
efnobody  1674     1 69.9 17.4 19:34 00:01:47 /usr/lib/jvm/jre/bin/java
-Xms1024m -Xmx1024m -XX:HeapDumpPath=/[...]/dumps/server.pid1549.hprof
-Djava.protocol.handler.pkgs=com.enginframe.common.utils.xml.handlers
-XX:ErrorFile=/[...]/dumps/server.hs_err_pid1549.log
-DjvmRoute=efserver1 -DEF_LICENSE_PATH=/opt/nice/enginframe/license
-DDERBY_DATA=/opt/nice/enginframe/data/derby -DEF_ERRORS_DIR=/opt/nice/
enginframe/data/errors -Def.repository.dir=/opt/nice/enginframe/repository
-XX:+HeapDumpOnOutOfMemoryError -DEF_ROOT=/opt/nice/enginframe/2017.0-r41442/
enginframe -DEF_DYNAMIC_ROOT=/opt/nice/enginframe/2017.0-r41442/enginframe
-DEF_CONF_ROOT=/opt/nice/enginframe/conf -DEF_DATA_ROOT=/opt/nice/enginframe/
data -Def.tmp.dir=/opt/nice/enginframe/tmp/efserver1 -DEF_SPOOLER_DIR=/opt/
nice/enginframe/spoolers -DEF_SESSION_SPOOLER_DIR=/opt/nice/enginframe/
spoolers -DEF_LOGDIR=/opt/nice/enginframe/logs/efserver1
-Dfile.encoding=UTF -classpath :/opt/nice/enginframe/2017.0-r41442/tomcat/lib/
sdftree-handler.jar:/opt/nice/enginframe/2017.0-r41442/tomcat/bin/
bootstrap.jar:/opt/nice/enginframe/2017.0-r41442/tomcat/bin/tomcat-juli.jar
 [...] org.apache.catalina.startup.Bootstrap start

---- Server Port Information ----
INFO: Starting ProtocolHandler ["http-bio-8443"]

---- Agent PID Information ----
root      1677     1  6.5  5.2 19:34 00:00:10 /usr/lib/jvm/jre/bin/java
-Xms512m -Xmx512m -XX:HeapDumpPath=/[...]/dumps/agent.pid1549.hprof
-XX:ErrorFile=/[...]/dumps/agent.hs_err_pid1549.log
-DEF_ROOT=/opt/nice/enginframe/2017.0-r41442/enginframe -DEF_DYNAMIC_ROOT=
/opt/nice/enginframe/2017.0-r41442/enginframe -DEF_CONF_ROOT=/opt/nice/
enginframe/conf -DEF_DATA_ROOT=/opt/nice/enginframe/data -DEF_SPOOLER_DIR=
/opt/nice/enginframe/spoolers -DEF_SESSION_SPOOLER_DIR=/opt/nice/enginframe/
spoolers -DEF_LOGDIR=/opt/nice/enginframe/logs/efserver1 -Dfile.encoding=UTF-8
-Djava.security.policy==/[...]/2017.0-r41442/enginframe/conf/ef_java.policy
 [...] -jar /opt/nice/enginframe/2017.0-r41442/enginframe/agent/agent.jar
```

```
# /opt/nice/enginframe/bin/enginframe stop

Reading EnginFrame version from: /opt/nice/enginframe/current-version
Current version: 2017.0-r41442

EnginFrame Control Script
Loading configuration from:
 - "/opt/nice/enginframe/conf/enginframe.conf"
Using EnginFrame in "/opt/nice/enginframe/2017.0-r41442"
Tomcat stopped.

[OK] EnginFrame Agent is down
```

Accessing the portal

After the EnginFrame daemons are running, you can access EnginFrame Portal in a browser window. To do this, in the browser's address bar, enter the host name of your EnginFrame Server followed by a colon (:) and your EnginFrame Server port number.

The EnginFrame Server port number was set during installation and can be viewed with the the following command.

```
# $EF_TOP/bin/enginframe status
```

For example, if the EnginFrame Server host is named *myhost*, and EnginFrame Server port number is `7070`, type in your browser's address bar as follows:

`http://myhost:7070`

If your host name (in this example, `myhost`) isn't resolved by your DNS, you can specify the corresponding IP address:

`http://192.168.0.10:7070`

Note

If you encounter an issue related to the DNS name, domain resolution, or the IP address, contact your network administrator for help.

If EnginFrame Server is installed successfully, the welcome page is displayed when you access the portal. If your browser reports errors such as `Cannot find the requested page`, `Server not found`, or `Problem loading page`, verify that EnginFrame is installed correctly by checking its status as described in Start or stop EnginFrame and check its status.

Demo sites

If you installed the EnginFrame *Developer's Documentation* when you installed EnginFrame, the welcome page, together with the production portal `Applications`, `Views`, and `Operational Dashboard`, displays a link to the `Technology Showcase`, which points to a set of demo services. These demo services provide an illustration of all of EnginFrame's service capabilities.

Important

By default, only the `EF_ADMIN` user can access administration and tutorial demo sites.

Operational Dashboard

In the EnginFrame *Operational Dashboard* view, administrators can monitor and manage operations directly from a web browser.

The Operational Dashboard is linked from the EnginFrame welcome page. Otherwise, you can reach it directly at:

```
http://host:port/context/admin
```

The Operational Dashboard offers a set of services that are divided into the following categories:

Topics

- Monitor
- Troubleshooting

- EnginFrame statistics

These services are listed in the navigation pane of the dashboard.

Monitor

You can view and use the services listed in **Monitor**.

- **Server Load** shows CPU usage, Java™ Virtual Machine memory usage, repository and spoolers file system size, and i-node usage.
- **Usage Statistics** shows current and historical data for the number of logged users, jobs with status, and interactive sessions and spoolers.
- **Installed Components** displays the list of installed EnginFrame plugins and versions.
- **Logged Users** shows the users logged into the portal, including an option to force user logout.
- **Triggers** can be used view and manage scheduled triggers in EnginFrame.
- **ACL Actors** shows EnginFrame ACL actors defined in the `authorization.xconf` files that are loaded by the system.

Troubleshooting

With the services listed in **Troubleshooting**, you can check portal status and health.

- **Run Self checks** performs several operations to exercise different functions and aspects of EnginFrame. Every test outputs a result and, in most cases, a quick hint to correct the problem.
- **View Error Files** can be used to display error files generated by EnginFrame when services produce the wrong output. You can choose an error to view by entering the error file name, by selecting errors from a list, or by entering an error number.
- **Collect Support Info** gathers a wide range of information about EnginFrame Portal and its configuration. This service output is a compressed archive containing all gathered information. Attach this package when sending your request to EnginFrame support.

EnginFrame statistics

To collect information about license usage, jobs usage, and others useful statistics, EnginFrame uses RRD4J as round-robin database.

RRD4J is a high-performance data logging and graphing system for time series data, implementing RRDTool's functionality in Java™. It follows much of the same logic and uses the same data sources, archive types, and definitions that RRDTool uses.

EnginFrame creates a database for general usage information that's named `efstatistics.rrd` and a database for each license file that's named `license_<component>_<expiration>_<maxToken>.rrd`. A new database will be created when a license file changes.

In the `admin.statistics.efconf` configuration file, you can configure some RRD4J specific parameters to change archive time intervals or to configure historical charts. For more information, see the RRD4J website.

When you run EnginFrame for the first time, database files are created and loaded with data, and then they're updated every 60 seconds with new data.

Workspace

In the EnginFrame *Workspace* view, users can create, manage, and submit both batch and interactive services.

The Workspace is linked from the EnginFrame welcome page or can be reached directly using the following URL.

```
http://<host>:<port>/<context>/applications
```

The Workspace offers two interfaces for two different user roles: *Admin View* and *User View*.

Admin View

You can use the *Admin View* interface to monitor interactive sessions, jobs, hosts, and to manage services, Workpsace users and portal appearance.

- *Monitor » All Sessions* can by used by the administrator to manage interactive sessions for all Workpsace users.
- *Monitor » All Jobs* can be used by the administrator to monitor and manage DRM jobs for all Workpsace users. To control the jobs of other users' Workpsace administrator must have the proper rights in the underlying DRM.
- *Monitor » Hosts* can be used by the administrator to monitor the status of the hosts of the configured DRMs.

- *Manage » Services* can be used by the administrator to create, delete, edit, or publish batch and interactive services.
- *Manage » Users* service allows the administrator to register, import, or manage Workpsace users.
- *Manage » Appearance* service enables the administrator to change the company logo and the Portal color theme.

User View

You can use *User View* to monitor user data, sessions, jobs and hosts, together with Batch and Interactive services that are published by the Workspace administrators.

- *Data » Spoolers* shows the user's EnginFrame Spoolers and provides rename and delete operations.
- *Data » Files* allows the user to browse and manage files in their home directory.
- *Monitor » Sessions* can be used by the user to monitor and manage their interactive sessions.
- *Monitor » Jobs* can be used by the user to monitor and manage their jobs.
- *Monitor » Hosts* can be used by the user to monitor the status of the hosts of the configured DRMs.

Workspace administrators can create and publish new services through the Admin View. When they publish a new service, administrators can make it available to all users or only to specific groups of users.

Note

The Workspace requires a specific license. Contact `<helpdesk@nice-software.com>` or your EnginFrame reseller to purchase a license, perform a license change or obtain a demo license. EnginFrame doesn't require a license on an EC2 instance. For more information about licensing, see Obtaining NICE EnginFrame.

Virtual Desktop

EnginFrame includes the *Virtual Desktop* to create, manage, and submit Interactive services.

The Virtual Desktop is linked from the EnginFrame welcome page or can be reached directly at

:`http://<host>:<port>/<context>/vdi`

The Virtual Desktop offers two interfaces for two different users' roles: *Admin's Portal* and *User View*.

Admin View

You can use the *Admin View* to monitor and manage interactive sessions, jobs, hosts, services, users and portal appearance.

- *Monitor » All Sessions* can be used by the administrator to manage interactive sessions for all Virtual Desktop users.
- *Monitor » Hosts* can be used by the administrator to monitor the status of the hosts of the configured DRMs.
- *Manage » Interactive Services* can be used by the administrator to create, delete, edit, or publish Interactive services.
- *Manage » Users* can be used by the administrator to register, import, and manage Virtual Desktop users.
- *Manage » Appearance* can be used by the administrator to change the company logo and the Portal color theme.

User View

You can use the *User View* to monitor user's sessions and cluster hosts, together with the Interactive services published by Virtual Desktop administrators.

- *Monitor » Sessions* can be used by the user to monitor and manage their interactive sessions.
- *Monitor » Hosts* can be used by the user to monitor the status of the hosts of the configured DRMs.

Virtual Desktop administrators can create and publish new services through the Admin View. They can publish these services to specific users or groups of users.

Administration

Topics

Common administration tasks

Most of the tasks an EnginFrame administrator has to perform involve editing configuration files. This chapter provides an overview of the main EnginFrame configuration files and then focuses on some common administration tasks, explaining in detail how to accomplish them.

This chapter describes the following tasks:

Topics

- Apache®-Tomcat® connection
- Changing charts backend
- Interactive administration
- Views administration
- Applications administration

Other important administration tasks regarding EnginFrame Portal's specific sub-components (like spooler management, logging, etc.) are described in the next chapters.

Note

Starting March 31, 2022, NICE EnginFrame doesn't support VNC®, HP® RGS, VirtualGL, and Amazon DCV 2016 and previous versions.

Main configuration files

In this section the main EnginFrame configuration files are described. Further details can be found throughout this guide.

Starting from EnginFrame 2015, configuration files are isolated from the rest of EnginFrame installation in `$EF_TOP/conf`. Configuration files in `$EF_TOP/conf` are preserved during updates.

EnginFrame still uses internal configuration files located under `$EF_TOP/<VERSION>` and organized according to the pre-EnginFrame 2015 directory-tree layout (i.e. `$EF_TOP/<VERSION>/enginframe/conf` and `$EF_TOP/<VERSION>/enginframe/plugins/<plug-in>/conf`, ...).

Some of these files define default values which can be overridden using files with the same name under the `$EF_TOP/conf` tree. Note any modifications to files under `$EF_TOP/<VERSION>` are discouraged and the files under this directory are subject to change in the next EnginFrame versions without notice.

`enginframe.conf`

It is located in `$EF_TOP/conf` directory.

As already seen in Fine-tuning your installation, this file configures the JDK running EnginFrame Server and EnginFrame Agent and the execution options passed to the JVM. It also configures other execution environment parameters like locale or user running Tomcat® (referred to as `EF_NOBODY`).

`server.conf`

This is the server's main configuration file.

It is located in `$EF_TOP/<VERSION>/enginframe/conf` directory. Its contents are merged with `$EF_TOP/conf/enginframe/server.conf` if present. In case the same property is defined in both files the latter wins.

It also contains some parameters used by the *local agent* when executing services on EnginFrame Server's host on `EF_NOBODY`'s behalf.

`agent.conf`

This is the agent's main configuration file.

It is located in `$EF_TOP/<VERSION>/enginframe/conf` directory. Its contents are merged with `$EF_TOP/conf/enginframe/agent.conf` if present. In case the same property is defined in both files the latter wins.

`mime-types.xml`

It associates content types to files downloaded through the portal without requiring any change to the JDK settings.

It is located in `$EF_TOP/<VERSION>/enginframe/conf` directory. Its contents are merged, extended or overridden, with `$EF_TOP/conf/enginframe/mime-types.xml` if present. In the case the same MIME type is defined in both files the latter overrides the mapping.

For more information, see Managing internet media types.

`log.server.xconf`

It configures EnginFrame Server's logging.

It is located in `$EF_TOP/<VERSION>/enginframe/conf` directory. Overridden by `$EF_TOP/conf/enginframe/log.server.xconf` if present.

`log.agent.xconf`

It configures EnginFrame Agent's logging.

It is located in `$EF_TOP/<VERSION>/enginframe/conf` directory. Overridden by `$EF_TOP/conf/enginframe/log.agent.xconf` if present.

`authorization.xconf`

It's a configuration file for the EnginFrame authorization system. It defines users' groups and access control lists (ACLs).

Refer to Configuring authorization.

Deploying a new plugin

Two types of plugins exist from a deployment point-of-view: the official ones distributed by NICE and the custom ones produced in-house or distributed by third parties.

Important

Plug-ins designed for pre-2015 EnginFrame versions cannot be installed on newer EnginFrame. Please contact NICE and check if updated plug-ins are available.

Official NICE plugins

NICE's official plugins are distributed with an installer that sets up the plugin and deploys it inside EnginFrame.

If NICE *eftoken* plugin (sold separately) were to be installed, it would be done by executing:

```
# java -jar eftoken-X.Y.Z.jar
```

The installer asks EnginFrame's root directory, plugin specific configuration options, and then installs the code.

If EnginFrame Server and EnginFrame Agent are installed on two different hosts, unless otherwise specified in plugin documentation, the plugin has to be installed on both hosts.

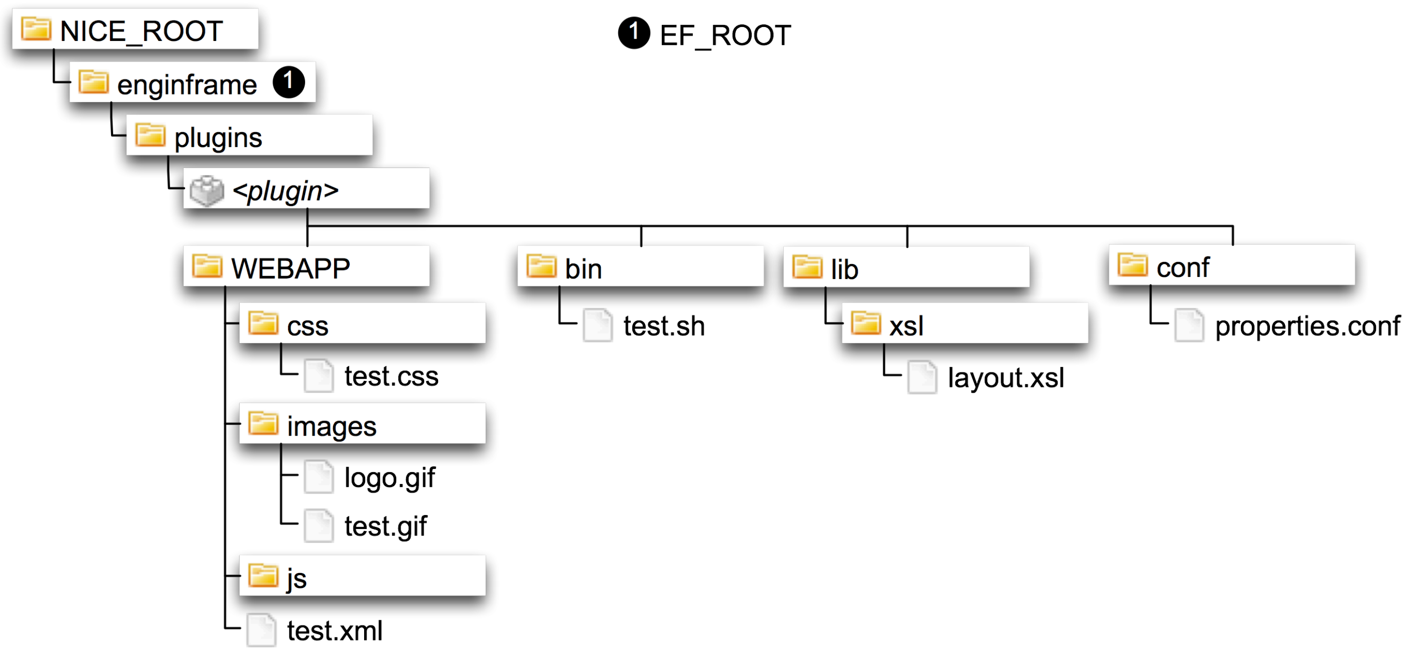
Unless stated otherwise in plugin documentation, once installed, the plugin is immediately available through EnginFrame Portal without requiring a restart.

Custom plugins

If you have a custom plugin or are deploying a third party plugin that is not distributed with an installer, a manual deployment is necessary. All EnginFrame plugins *must be* placed inside `$EF_TOP/<VERSION>/plugins` and follow the internal structure described below.

A plugin directory structure example is:

EnginFrame Plugin Structure



Some plugins may need additional setup operations to work properly. Read and follow the instructions distributed with plugin documentation.

Changing Java™ version

In some cases, such as an important security fix is shipped by Java™ vendor, changing the Java™ Platform running EnginFrame Portal is necessary.

The Java™ Platform running EnginFrame Server and EnginFrame Agent is defined using `JAVA_HOME` parameter inside `$EF_TOP/conf/enginframe.conf`. Changing this value is the only step necessary to use a different Java™ version to run these components.

Using Java™ installed in the directory `/opt/java` is done as follows:

```
JAVA_HOME="/opt/java"
```

EnginFrame Server and EnginFrame Agent restart is necessary to make changes effective.

Refer to Java™ platform for further information on supported Java™ versions.

Changing the default agent

A single EnginFrame Server can connect to many EnginFrame Agents to execute services.

The remote *default agent* is specified during installation. When both server and agent are installed on the same host, this agent automatically becomes the default one. When the server is installed alone, the installer asks default agent hostname and TCP port.

The default agent is defined in `server.conf` with two properties:

- `EF_AGENT_HOST`

  Specifies default Agent hostname or IP address. The default value is `localhost`.
- `EF_AGENT_PORT`

  Specifies default TCP port where Agent listens for incoming connections (i.e. parameter `ef.agent.port` in Agent configuration, see Configuring agent ports for more details). The default value is 9999.

  It is located in `$EF_TOP/<VERSION>/enginframe/conf` directory. Its contents are merged with `$EF_TOP/conf/enginframe/server.conf` if present. In case the same property is defined in both files the latter wins.

Service Definition Files use both properties.

So if an EnginFrame Server wants to set its default agent as `agent1.nice` listening on port 7777 the parameters mentioned above become:

```
EF_AGENT_HOST=agent1.nice
EF_AGENT_PORT=7777
```

`EF_AGENT_HOST` can also be set to an IP address, e.g. `192.168.1.16`.

Changes to these parameters do not require EnginFrame Server's restart.

Important

You *cannot* remove `EF_AGENT_HOST` and `EF_AGENT_PORT` from `server.conf`. If those properties are empty/missing, EnginFrame uses the default values.

Managing internet media types

When a file is downloaded from EnginFrame Portal the browser tries to open it with the application configured to manage its media type content. For example, if an image is downloaded the browser displays it inline, while if a Word document is downloaded, it launches Office.

EnginFrame suggests to browsers the best method to handle files by sending the *Internet media type* in the download response.

An Internet media type, originally called *MIME type*, is a two-part identifier for file formats on the Internet. The identifiers were originally defined in RFC 2046 for use in e-mails sent through SMTP, but their use has expanded to other protocols such as HTTP.

It is very useful to link uncommon file extensions to specific MIME types, so browsers can handle them correctly. Not all browsers use MIME type information in the same way. Older *Microsoft® Internet Explorer®* versions relies more on content type detection provided by *Windows® operating system* than on MIME type specified by the server's response message, especially for some of the most common file name extensions.

EnginFrame uses a built-in list of MIME types provided by the JDK. This list is defined in `JAVA_HOME/jre/lib/content-types.properties`.

EnginFrame overrides and extends this list of MIME types with `$EF_TOP/<VERSION>/enginframe/conf/mime-types.xml` in the static installation directory and with the optional `$EF_TOP/conf/enginframe/mime-types.xml` in the EnginFrame custom configuration directory tree. These files, owned by EnginFrame administrator, are used across the whole system unless more specific settings are found.

Each plugin has the possibility to extend and overrides the EnginFrame MIME types settings, by defining its own static `$EF_TOP/<VERSION>/enginframe/plugins/`*`plugin_name`*`/conf/mime-types.xml` and the associated customizable version `$EF_TOP/conf/plugins/`*`plugin_name`*`/mime-types.xml` in the EnginFrame configuration directory tree. MIME types defined in the plugin `mime-types.xml` files are used when downloading files from spoolers generated by services defined in the *`plugin_name`* plugin.

When EnginFrame receives a download request from the browser, it tries to associate a MIME type to the file. It first looks in the plugin specific `mime-types.xml` file, then in EnginFrame `mime-types.xml`. In the case it cannot associate a MIME type from its own configuration files, it uses the default definitions specified in JDK's `content-types.properties`.

More in details, when looking for a MIME type of a file EnginFrame checks resources in the following order:

1. Custom plug-in MIME types, `$EF_TOP/conf/plugins/`*`plugin_name`*`/mime-types.xml`
2. Static plug-in MIME types, `$EF_TOP/<VERSION>/enginframe/plugins/`*`plugin_name`*`/conf/mime-types.xml`
3. Custom EnginFrame system-wide MIME types, `$EF_TOP/conf/plugins/`*`plugin_name`*`/mime-types.xml`
4. Static EnginFrame system-wide MIME types, `$EF_TOP/<VERSION>/enginframe/conf/mime-types.xml`
5. Default JDK MIME types, `JAVA_HOME/jre/lib/content-types.properties`

If this chain of lookup for a specific MIME type fails, the default MIME type, if defined, is returned, otherwise an empty MIME type is sent back in the HTTP response by EnginFrame.

EnginFrame Server dynamically reloads the `mime-types.xml` files when they are modified, so no restart is necessary.

EnginFrame ships this `$EF_TOP/<VERSION>/enginframe/conf/mime-types.xml`:

```
<?xml version="1.0"?>
<ef:mime-types xmlns:ef="http://www.enginframe.com/2000/EnginFrame">

  <ef:default type="text/plain" />

  <ef:mime-type>
    <ef:type type="text/plain"/>
    <ef:desc desc="ASCII Text File"/>
    <ef:extensions>
      <ef:extension ext=".log"/>
    </ef:extensions>
    <ef:match-list>
      <ef:match expr="[A-Z0-9]*.ef" />
      <ef:match expr="README" casesensitive="false" />
    </ef:match-list>
  </ef:mime-type>

  <ef:mime-type>
    <ef:type type="application/x-javascript"/>
    <ef:desc desc="JavaScript File"/>
    <ef:match-list>
      <ef:match expr="^.*[Jj][Ss]" />
    </ef:match-list>
  </ef:mime-type>

  <ef:mime-type>
    <ef:type type="application/json"/>
    <ef:desc desc="JSON File"/>
    <ef:match-list>
      <ef:match expr="^.*\.[Jj][Ss][Oo][Nn]" />
    </ef:match-list>
  </ef:mime-type>

  <ef:mime-type>
    <ef:type type="text/css"/>
    <ef:desc desc="CSS File"/>
    <ef:match-list>
      <ef:match expr="^.*[Cc][Ss][Ss]" />
    </ef:match-list>
  </ef:mime-type>

  <ef:mime-type>
    <ef:type type="image/vnd.microsoft.icon"/>
    <ef:desc desc="ICO File"/>
    <ef:match-list>
      <ef:match expr="^.*[Ii][Cc][Oo]" />
    </ef:match-list>
  </ef:mime-type>
</ef:mime-types>
```

The `<ef:extensions>` section contains exact matches. Thus, in this example, EnginFrame associates `text/plain` MIME type to any file ending with extension `.log` or `.patch`.

The `<ef:match-list>` section contains regular expressions for matching a file name. Thus, in this example, EnginFrame associates `text/plain` MIME type to all files whose name contains only alphanumeric characters and whose extension is `.ef` and to all files named `README`.

Since the `casesensitive` attribute is set to `false` in the first `<ef:match>` tag, a matching is performed that is not case sensitive. This means, for example, that files named `license.ef` or `LICENSE.EF` are matched. If `casesensitive` attribute is not explicitly set to `false`, a case sensitive match is performed. So files named `readme` or `ReadMe` are not matched by the regular expression defined in the second `<ef:match>` tag.

`<ef:default>` is a child of `<ef:mime-types>` tag. It specifies a default MIME type for those cases where a MIME type cannot be guessed. The syntax is: `<ef:default type="`*`expected_mime_type`*`" forward-guess="`*`[true|false]`*`" />`

Attribute `forward-guess` set to `true` allows to interrupt MIME type lookup at the current `mime-types.xml` file without considering upstream MIME type settings. Its default value is `false`.

The default value can be overridden following the same lookup order for `mime-types.xml` files as reported in the list above.

Important

There are two settings concerning security and MIME types in the `server.conf` configuration file that are important to be described here: `ef.download.mimetype.mapping.text` and `ef.download.mimetype.mapping.octetstream`.
`ef.download.mimetype.mapping.text`: a comma separated list of MIME types that, for security reasons, are mapped to `text/plain` in the HTTP response to clients when downloading a file. This further MIME type mapping prevents browsers from interpreting and rendering the downloaded files protecting against malicious code that could be executed on the client browser (cross-site scripting attack).
`ef.download.mimetype.mapping.octetstream`: a comma separated list of MIME types that, for security reasons, are mapped to `application/octet-stream` in the HTTP response to clients when downloading a file. This further MIME type mapping prevents browsers from taking any action on the downloaded files protecting against malicious code that could be executed on the client host.

For more information about these XML tags, see *EnginFrame Administrator Reference*.

Customizing error page layout

Whenever EnginFrame encounters an error during service execution, it displays an error message on the browser using a well known layout. All errors that end up on browser are displayed with the same look and feel.

Error page layout customization is achieved by changing `ef.error.layout` value inside `server.conf`. This value must be an absolute path to an XSL file containing customized style sheets. `$EF_TOP/<VERSION>/enginframe/lib/xsl/com.enginframe.error.xsl` is the default value for `ef.error.layout`. This file can be used as a starting point to create customized templates.

So, if `$EF_TOP/<VERSION>/enginframe/plugins/mycompany/lib/xsl/mycompany.error.xsl` contains the customized XSL templates, `ef.error.layout` is set as follows: `ef.error.layout=${EF_ROOT}/plugins/mycompany/lib/xsl/mycompany.error.xsl`

Changes to `ef.error.layout` do not require a server restart.

Limiting service output

EnginFrame's usual client is a web browser. Limiting amount of data sent to browsers saves resources on client-side. When a service execution produces a big amount of XML/HTML, the browser could have trouble rendering the page.

To avoid overloading the clients (and server/agent that have to produce/process the data), the maximum amount of data that services can produce is definable using `ef.output.limit`. If the limit is exceeded, the service's output is truncated and an error message is displayed on the browser.

`ef.output.limit` is specified as number of bytes and the default value is `52428800`, i.e. `50 MB`.

Since services are usually executed by a *remote agent*, this property is set inside the agent's `agent.conf`.

The following example shows how to set this property to limit service's output to `2 KB` (`2048` bytes) of data: `ef.output.limit=2048`

However, since *local agent* can also execute services, `ef.output.limit` is also defined inside `server.conf`.

EnginFrame Agent and/or the EnginFrame Server restart is not required when changing this property.

Note

The service execution is not influenced in any way by the specified limit.

The service output is truncated on agent before sending it back to the server.

Configuring agent ports

EnginFrame Agent and EnginFrame Server communicate using Java™ RMI over SSL protocol. Technically speaking, EnginFrame Agent is an RMI server that exposes a remote object whose methods are invoked by EnginFrame Server.

For this reason, EnginFrame Agent needs to open two TCP ports on its host: one port is used by an *RMI Registry* while the other one is used by an RMI server. These ports are chosen during installation (by default they are respectively 9999 and 9998).

`$EF_TOP/conf/enginframe/agent.conf` contains the values specified during installation. Edit this file to change these values:

- `ef.agent.port`

  Specifies TCP port on which RMI Registry is listening.

  If this property is empty, the default port 9999 is used.

  The specified value must be a valid TCP port that is not used by other processes on the same host.
- `ef.agent.bind.port`

  Specifies TCP port on which RMI server is listening.

  If this property is empty or is `0`, a random free port is chosen at EnginFrame Agent startup.

  The specified value must be `0` or a valid TCP port that is not used by other processes on the same host. Furthermore, the specified value must be different from `ef.agent.port`.

For example, using port 7777 for RMI Registry and port 7778 for RMI server, the two parameters must be set in the following way:

```
ef.agent.port=7777
ef.agent.bind.port=7778
```

EnginFrame Agent must be restarted to make changes effective.

Tip

If there is a firewall between EnginFrame Server and EnginFrame Agent then `ef.agent.bind.port` has to be set to a value different from zero. The firewall has to be configured to allow EnginFrame Server to open TCP connections towards EnginFrame Agent using the ports specified by `ef.agent.port` and `ef.agent.bind.port`.

If `ef.agent.port` is changed, then all `<ef:location>`'s `port` attributes have to change accordingly inside *Service Definition Files*.

Modify `EF_AGENT_PORT` inside `$EF_TOP/conf/enginframe/server.conf` if default agent's ports changed. Refer to Changing the default agent for more details.

Customizing user switching

Unless EnginFrame was installed by an unprivileged user, every time EnginFrame Agent runs a service it *impersonates* the system user associated to portal user requesting service execution. This ensures service execution is performed as a regular system user (`root` is not allowed to run services) and the files created/modified have proper ownerships and permissions.

EnginFrame allows modifying how *user switching* is done to affect service execution environment and ultimately service execution itself.

EnginFrame Agent user switching mechanism is based on **su** shipped with every Linux®.

`$EF_TOP/conf/enginframe/agent.conf` configures `ef.switch.user.params` parameter used to specify options passed to **su**. Multiple parameters must be separated by a space without using quotes or double quotes like in the following example: `ef.switch.user.params=-f -m`

An empty `ef.switch.user.params` means no options are passed to **su**: `ef.switch.user.params=`

A missing `ef.switch.user.params` is automatically set to `-` which results in the user's profile being sourced when **su** is executed. By default, `ef.switch.user.params` property is not set.

Tip

If user profiles on EnginFrame Agent's host are complicated and sourcing them affects service execution performance, it is suggested to set `ef.switch.user.params` to avoid sourcing them when **su** is executed. You can, for example, set `ef.switch.user.params` to the empty string.

EnginFrame Agent does not have to be restarted when changing this parameter.

Customizing user session timeout

A session defines a user's working period within EnginFrame Portal. A session starts at user login and ends either when user logs out or when EnginFrame Server invalidates it.

Session timeout specifies the number of minutes a user can remain idle before the portal terminates the session automatically. If a user does not interact with EnginFrame within the configured timeout, the session is automatically invalidated and user has to authenticate again to access EnginFrame Portal.

The default session timeout, defined for all users, is set to *30 minutes*.

Session timeout can be changed in `EF_ROOT/WEBAPP/WEB-INF/web.xml` by changing the `session-timeout` value. This value is expressed in a whole number of minutes. If the timeout is *0* or less, the container ensures the default behaviour of sessions is never to time out.

Changing session timeout to two hours, can be achieved modifying `session-timeout` value in the following way: `<session-config> <session-timeout>120</session-timeout> </session-config>`

Changes to session timeout require EnginFrame Server's restart.

Apache®-Tomcat® connection

There are many reasons to integrate Tomcat® with Apache®. And there are reasons why it should not be done too. Starting with newer Tomcat (EnginFrame ships version 9.0.64), performance reasons are harder to justify. So here are the issues to discuss in integrating vs not:

- *Encryption* - The Apache HTTP Server module mod_ssl is an interface to the OpenSSL library, which provides Strong Encryption using the Secure Sockets Layer and Transport Layer Security protocols. Tomcat is able to provide a similar encryption using the JVM, which needs to be cross platform, so it is somehow less efficient than Apache. Moreover, Apache has a longer experience on this field.

- *Clustering* - By using Apache as a front end you can let Apache act as a front door to your content to multiple Tomcat instances. If one of your Tomcats fails, Apache ignores it and your Sysadmin can sleep through the night. This point could be ignored if you use a hardware load balancer and the clustering capabilities of EnginFrame Enterprise Edition.
- *Clustering/Security* - You can also use Apache as a front door to different Tomcats for different URL namespaces (/app1/, /app2/, /app3/, or virtual hosts). The Tomcats can then be each in a protected area and from a security point of view, you only need to worry about the Apache server. Essentially, Apache becomes a smart proxy server.
- *Security* - This topic can sway one way or another. Java™ has the security manager while Apache has a larger mindshare and more tricks with respect to security. Details will not be given here, but let Google™ be your friend. Depending on your scenario, one might be better than the other. But also keep in mind, if you run Apache with Tomcat you have two systems to defend, not one.
- *Add-ons* - Adding on CGI, Perl, PHP is natural to Apache. It's slower for Tomcat. Apache also has hundreds of modules that can be plugged in at will. Tomcat can have this ability, but the code has not been written yet.
- *Decorators* - With Apache in front of Tomcat, you can perform any number of decorators that Tomcat does not support or does not have the immediate code support. For example, `mod_headers`, `mod_rewrite`, and `mod_alias` could be written for Tomcat, but why reinvent the wheel when Apache has done it so well?
- *Speed* - Apache is faster at serving static content than Tomcat. But unless you have a high traffic site, this point is useless. But in some scenarios, Tomcat can be faster than Apache. So benchmark *your* site.
- *Socket handling/system stability* - Apache has better socket handling with respect to error conditions than Tomcat. The main reason is that Tomcat must perform all its socket handling via the JVM which needs to be cross platform. The problem is that socket optimization is a platform specific ordeal. Most of the time the Java™ code is fine, but when you are also bombarded with dropped connections, invalid packets, invalid requests from invalid IPs, Apache does a better job at dropping these error conditions than JVM based program. (YMMV)

[Source: Tomcat Wiki].

There are at least two ways to configure an Apache Web Server as a frontend to Tomcat according to the protocol used:

- HTTP
- AJP [see Protocol Reference].

The connection between Apache and Tomcat using protocol AJP can follow two different strategies:

- Apache Module `mod_proxy_ajp` (Apache version 2.2 or higher)
- Tomcat Connector JK

Changing charts backend

Charts can be embedded dynamically in EnginFrame web pages.

By default, the internal charts provider is used, but is possible to use any other service compatible with Google™ Chart API.

The chart backend can be changed in two ways:

- Globally for all charts that EnginFrame produces.
- Locally for specific chart.

In the first case, edit `$EF_TOP/conf/enginframe/server.conf` specifying `ef.charts.base.url`:

```
ef.charts.base.url=http://chart.apis.google.com/chart
```

In the second case, set `base` attribute inside chart root tag:

```
<ch:chart ... base="http://chart.apis.google.com/chart" ... >
```

Interactive administration

Topics

- Configuration files

Configuration files

Most of the times the values defined during the Interactive Plugin installation provide all the information necessary to have a working setup. However sometimes further configuration is needed to tailor the session broker to specific system and network conditions or to change the values defined during the installation.

All the Interactive Plugin configuration files are located in the `conf` subdirectory.

Note

All the parameters in the configuration files with extension different from `.efconf` comply with the following format from Bourne shell: `PARAMETER_NAME="parameter value"` In particular,

- There are *no spaces* before and after the = (equals).
- You can use shell variable references with the usual syntax `$variable`. Always enclose variable names with curly braces, for example: `${HOME}`.
- Bourne shell escaping and quoting syntax apply. Be sure to enclose values containing spaces within the most appropriate quotes.

Important

Configuration parameters are automatically loaded upon saving. No need to restart EnginFrame or logout.

Topics

- authorization.xconf
- nat.conf
- proxy.conf
- url.mapping.conf
- xstartup files
- mime-types.xml

`interactive.efconf`

This file contains Interactive Plugin's main default configuration parameters, that can be usually overridden by each portal service.

Default Parameters

`INTERACTIVE_DEFAULT_OS`

- value: *required*
- default: *linux*

By default, interactive session will be launched on the operating system stated by `INTERACTIVE_DEFAULT_OS` parameter.

Available values:

- `linux` - schedule on Linux® operating systems
- `windows` - schedule on Windows® operating systems

This behavior can be overridden by each service itself by using `--os <system>` option of *interactive.submit*

Example: `INTERACTIVE_DEFAULT_OS=linux`

`INTERACTIVE_DEFAULT_JOBMANAGER`

- value: *optional*
- default: *lsf*

Default job manager for submitting interactive session jobs. Each session will be scheduled as a single job.

This behaviour can be overridden by each service itself by using `--jobmanager <jobmanager>` option of *interactive.submit*

> **Note**
>
> Your EnginFrame installation requires the related grid middleware plugin to be installed and configured. Interactive Plugin will use it to submit and manage interactive session jobs.

Example: `INTERACTIVE_DEFAULT_JOBMANAGER=lsf`

`INTERACTIVE_DEFAULT_REMOTE`

- value: *optional*
- default: *dcv2*

Default visualization middleware to use.

Available values:

- `dcv2` - use Amazon DCV (since 2017.0) visualization middleware

Example: `INTERACTIVE_DEFAULT_REMOTE=dcv2`

`INTERACTIVE_DEFAULT_VNC_QUEUE`

- value: *optional*
- default: *(not set)*

Sets the default resource manager queue to use. Interactive session jobs will be submitted on that queue.

This behaviour can be overridden by each service itself by using `--queue <queue name>` option of *interactive.submit*

Example: `INTERACTIVE_DEFAULT_VNC_QUEUE=int_windows`

Limits

`INTERACTIVE_DEFAULT_MAX_SESSIONS`

- value: *optional*
- default: *undefined (no limits)*

The maximum number of interactive sessions per interactive class.

If you set this default limit to `X`, each user will be able to start up to `X` sessions of the same interactive class.

For more informations about interactive classes and sessions limits, please refer to Session limits

Example: `INTERACTIVE_DEFAULT_MAX_SESSIONS=3`

`interactive.<remote>.resolutions.conf`

Inside this file you can specify some presets of the Remote Visualization Technology desktop geometry as a four-valued colon-separated string plus a label. The label must separated by the previous fields by one or more spaces `widthxheight:fullscreen:allmonitors label` `width` and `height` are integers and express the size in pixels, `fullscreen` and `allmonitors` are case-sensitive boolean flags {`true`|`false`} and `label` is a human readable string describing the preset.

You can use the keyword `auto` to let the system guess the current screen resolution. If the list of presets includes a line containing the string `custom` (no other content on the same line), the user will be able to specify a custom resolution.

Note

Flag `allmonitors` is meaningful only when `fullscreen` is true. If you set `allmonitors=true` while `fullscreen=false`, then `allmonitors` parameter will be automatically converted to false.

Default content of the file:

```
auto                     Fullscreen on single monitor (autodect resolution)
5120x1600:true:true      Fullscreen on two 30' monitors (5120x1600)
```

```
3840x1200:true:true    Fullscreen on two 24' monitors (3840x1200)
2560x1600:true:false   Fullscreen on single 30' monitor (2560x1600)
1920x1200:true:false   Fullscreen on single 24' monitor (1920x1200)
1024x768:false:false   Window-mode on singla XGA monitor (1024x768)
custom
```

`authorization.xconf`

This file contains the ACL (Access Control List) definitions specific to Interactive Plugin. It defines some ACLs that are used in the demo portal to allow or deny access to the different visualization middlewares to different users.

For more details on EnginFrame ACL system, general EnginFrame authorization and its configuration, please refer to EnginFrame Administrator Guide, *Security* section, *Authorization System* chapter.

`nat.conf`

If you set up NAT (Network Address Translation) so that the client machines connect to the cluster nodes through a different IP:PORT pair, this file allows to map IP:PORT pairs for services running on a node to the corresponding public IP:PORT pair.

> **Note**
>
> Some visualization middleware clients require that the actual port of the service equals the NATted port

The syntax consists of a line made of two pairs: the real IP:PORT pair followed by the public IP:PORT pair. It is possible to specify a group of ports using the fromPORT-toPORT syntax.

Example:

```
node01 mycompany.com
node01 10.100.0.101
node12:42976 mycompany.com:42976
node01:7900-7910 mycompany.com:5900-5910
node05:7900-7910 10.100.0.101:5900-5910
```

A session starting on host node01, port 7901 would be returned to the client as mycompany.com:5901

`proxy.conf`

If you give access to cluster nodes through a proxy, you can configure this file to assign for each connection a specific proxy server to use.

Note

This configuration applies only to DCV connections.

The default configuration is to have a direct connection from any client to any server, so no proxy for all connections.

The syntax consists of a table, each line has the following columns: `PRIORITY`, `CLIENT-FILTER`, `SERVER-FILTER`, `PROXY-TYPE`, `PROXY-ADDRESS`:

PRIORITY

a number to rank the proxy list, 0 is the highest priority

CLIENT-FILTER

the range of IP addresses in the format: NETWORK/PREFIX

Examples:

```
10.20.0.0/16
0.0.0.0/0    (matches any IP address)
```

SERVER-FILTER

a glob pattern matching the server hostname

Examples:

```
node*        (matches any node starting with "node")
node0[1-9]   (matches hosts from node01 to node09)
```

PROXY TYPE

the proxy type to use, can be:

HTTP

proxy must support HTTP Connect protocol

SOCKS

proxy must support SOCKS5 protocol

DIRECT

special value to specify no proxy

PROXY-ADDRESS

the proxy hostname and port in the format *host:port* (not used in case proxy type is DIRECT).

Examples:

```
squidproxy.domain:3128
danteproxy:80
10.20.1.1:3128
```

In case multiple proxies with the same priority match, one of them is selected using an internal strategy.

In case no proxy for a priority matches, the proxies in the next priority are checked.

In case no proxy line matches, an error is returned to the client.

Example: no connection will receive a proxy configuration

```
99            0.0.0.0/0     *             DIRECT
```

Example: only connections to `node01` will pass through `proxyserver:3128`, all other connections will be direct.

```
1             0.0.0.0/0     node01        SOCKS    proxyserver:3128
99            0.0.0.0/0     *             DIRECT
```

Example: connections from `IP 10.20.3.20 to node01` will pass through `proxyserver:80`, other connections to `node01` will pass through `proxyserver:3128`, all other connections will get an error.

```
0             10.20.3.20/32 node01        HTTP     proxyserver:80
1             0.0.0.0/0     node01        SOCKS    proxyserver:3128
```

`url.mapping.conf`

The new URL mapping configuration allows EnginFrame administrators to configure the target endpoints that will be used by clients to connect to the Amazon DCV (since 2017.0) remote servers. The configuration file to define the target DCV servers URLs endpoints is `${EF_CONF_ROOT}/plugins/interactive/url.mapping.conf`.

In this configuration file the administrator can write multiple mappings each one defining a matching rule and a target endpoint. Each rule can match one or more DCV servers as provided upstream by the system by using a set of predefined variables and glob expression. For each match the configuration provides a mapped endpoint that is a triple that includes the host, port and web URL path that will be used by clients to connect to the target DCV server.

Inside the `${EF_CONF_ROOT}/plugins/interactive/url.mapping.conf` configuration file it is possible to use the usual set of EnginFrame environment variables available during a service execution (e.g. `EF_*`, session variables) together with the interactive session metadata and a new set of noteworthy variables:

- `${server_host}` - the remote DCV server host as provided by the system in the upstream process;
- `${server_port}` - the remote DCV server port as configured on the DCV server node;
- `${server_web_url_path}` - the DCV server web URL path as configured on the DCV server node;
- `${session_id}` - the DCV session ID;
- `${nat_server_host}` - the value of the DCV server host coming from `${EF_CONF_ROOT}/plugins/interactive/nat.conf`;
- `${nat_server_port}` - the value of the DCV server port coming from `${EF_CONF_ROOT}/plugins/interactive/nat.conf`;
- `${proxy_host}` - the proxy host coming from `${EF_CONF_ROOT}/plugins/interactive/proxy.conf`;
- `${proxy_port}` - the proxy port coming from `${EF_CONF_ROOT}/plugins/interactive/proxy.conf`;

Every single value of the tuple, target host, target port and target web URL path, is evaluated separately. Variables are expanded and command substitution executed.

Important

Parameters evaluation is performed on behalf of the user running the Apache Tomcat® server (e.g. `efnobody`), on the host where EnginFrame runs.

Note

The only supported protocol for the mapped URL is HTTPS and cannot be changed.

For further information and examples consult directly the `${EF_CONF_ROOT}/plugins/interactive/url.mapping.conf` configuration file.

`xstartup` files

The configuration directory also contains a collection of sample `xstartup` files named `*.xstartup` that may be used in your service definitions to start a X session with the specified Window Manager.

Common tasks for xstartup scripts are, e.g. launching *dbus* daemon, opening an xterm window or setting specific Window Manager parameters.

An example xstartup script:

```
#!/bin/bash
[ -r $HOME/.Xresources ] && xrdb $HOME/.Xresources
xsetroot -solid grey
vncconfig -iconic &
xterm -geometry 80x24+10+10 -ls -title "$VNCDESKTOP Desktop" &
```

The xstartup files shipped with Interactive Plugin are:

- `gnome.xstartup`, xstartup script for GNOME window manager.
- `icewm.xstartup`, xstartup script for ICE window manager.
- `kde.xstartup`, xstartup script for KDE window manager.

- `mate.xstartup`, xstartup script for MATE window manager.
- `metacity.xstartup`, xstartup script for Metacity window manager.
- `mwm.xstartup`, xstartup script for Motif window manager.
- `xfce.xstartup`, xstartup script for Xfce window manager.
- `xfwm4.xstartup`, xstartup script for Xfwm4 window manager.

Default Xstartup are *gnome.xstartup* for desktop sessions and *mwm.xstartup* for standalone interactive applications.

`mime-types.xml`

This file defines some mime-types useful for Interactive Plugin. Mime-types in this context are used to associate client viewers like VNC® Viewer to files generated by Interactive Plugin with specific extensions.

File extensions specified in this file are *.dcv*, *.vnc*, *.efrgs*, and *.rgreceiver*.

For more details on EnginFrame mime-types configuration and customization, refer to EnginFrame Administrator Guide, *Administration* section, *Common Administration Tasks* chapter.

Interactive Session Life-cycle Extension Points

Interactive Session Dynamic Hooks

EnginFrame, starting from version 2017.2, adds two new extension points (hooks) to the interactive session life cycle.

The first customizable hook, basically a shell script, it's called when the session has been successfully setup on the remote host and it's ready to pass to the "Running" state. This hook is meant to execute some simple setup operations at session startup, e.g. to dynamically configure a gateway technology as the AWS Application Load Balancer (ALB) or an Nginx instance, enabling the clients to access the underlying dynamic infrastructure.

The hook has also the capability to add custom metadata to the session and to configure the target host, port and web URL path tuple to be used by the clients to connect to the session.

In order to set the connection parameters to be used by the clients to connect to the interactive session, the hook script has to export the following variables in the environment:

- `INTERACTIVE_SESSION_TARGET_HOST`
- `INTERACTIVE_SESSION_TARGET_PORT`
- `INTERACTIVE_SESSION_TARGET_WEBURLPATH`

These variables will be set as session metadata and used to forge the session URL and connection .dcv file upon a client request through the EnginFrame portal. The configuration of these interactive session settings will have the precedence over the static configuration files (e.g. `nat.conf`, `url.mapping.conf`) in defining the connection parameter for the clients.

Inside the hook script, it is possible to use the usual EnginFrame environment variables together with the session metadata variables. Noteworthy variables that can be useful to the hook logic are:

- `${INTERACTIVE_SESSION_REMOTE_SESSION_ID}` - the ID for a DCV 2017 session;
- `${INTERACTIVE_SESSION_EXECUTION_HOST}` - the execution host of the DCV session as determined internally by the system;
- `${INTERACTIVE_SESSION_DCV2_WEBURLPATH}` - the web URL path of the DCV server, as configured in `/etc/dcv/dcv.conf` on the DCV server node;
- `${INTERACTIVE_DEFAULT_DCV2_WEB_PORT}` - the web port of the DCV server, as configured in `${EF_CONF_ROOT}/plugins/interactive/interactive.efconf`;

The second customizable hook is executed when the session goes in the “Closed” or “Failed” state.

The locations of the starting and closing hooks are configured in `${EF_CONF_ROOT}/plugins/interactive/interactive.efconf` through the variables `INTERACTIVE_SESSION_STARTING_HOOK` and `INTERACTIVE_SESSION_CLOSING_HOOK` respectively.

Hooks execution is done by the user running the Apache Tomcat® server (e.g. `efnobody`), and their standard output and standard error are logged in two log files in the interactive session spooler. They are accessible via web from the session details view.

Important

In case of errors the starting hook will block the session startup avoiding the session to go in the “Running” state. If the starting hook fails, it will keep the session in the “Starting” status, and the session will be flagged with a warning message.

The result of the closing hook instead doesn't prevent the session to go in the terminal state. If the closing hook fails the session will anyway terminate and it will be flagged with a warning message.

Warning

The execution of the hooks can be triggered either by a user action (e.g. submission or closing operation) or by the EnginFrame internal process that updates the interactive sessions status. At the moment there is no mutual-exclusion mechanism in place and hooks may run concurrently on the same session. It's up to the hook scripts to be concurrency-safe.

Hooks also allow to set custom metadata to the interactive session. Any environment exported variable with prefix `SESSION_` will be added as metadata to the interactive session. All the session metadata are available to the hook scripts.

Sample Starting and Closing Hooks to Configure an AWS ALB

Sample starting and closing hooks to dynamically configure the AWS Application Load Balancer (ALB) on session creation and session closing, are provided in:

- `${EF_ROOT}/plugins/interactive/bin/samples/sample.alb.session.starting.hook.sh`
- `${EF_ROOT}/plugins/interactive/bin/samples/sample.alb.session.closing.hook.sh`

It is suggested to copy the scripts under `${EF_DATA_ROOT}/plugins/interactive/bin` before configuring or modifying them.

These scripts configure an AWS ALB to enable a connection to a host where a Amazon DCV (since 2017.0) interactive session is running.

The starting hook script creates a new Target Group containing the instance where the Session is running and adds a new Listener Rule for the HTTPS listener of the ALB.

The Listener Rule has the role to associate the input URL path to the Target Group. This path must be the web URL path of the DCV server running on the execution node.

Important

Since it not possible to do URL path translations with an ALB, every DCV server must have an unique web URL path configured. It is suggested to use the hostname of the node as web URL path for the DCV server running on that node.

The maximum number of Listener Rule(s) per ALB is 100, hence a single ALB can handle at most 100 interactive sessions running concurrently. To increase this limit, please consider to add more ALBs in the infrastructure and to implement a rotation in the starting hook script.

Prerequisites for using the sample hook scripts provided:

- On EnginFrame node:
  - AWS Command Line Interface (AWS CLI) must be installed;
  - Since this script is going to be executed by the user running the EnginFrame Server, i.e. the Apache Tomcat® user, an AWS CLI profile must be configured for that user, having the permissions to list instances and to manage load balancers. (see CLI Getting Started). Alternatively, if EnginFrame is installed in an EC2 instance, a valid AWS role to perform the above mentioned operations should be added to this instance;
- On AWS account:
  - An AWS Application Load Balancer with an HTTPS listener with a Default Target Group must be already configured and running.

  On DCV server nodes:

  - Each DCV server node must be configured with a unique web URL path (see `/etc/dcv/dcv.conf` configuration file).

The following is an example of the steps to do in order to use the sample AWS ALB hook scripts provided:

- Copy the samples from `${EF_ROOT}/plugins/interactive/bin/samples` to `${EF_DATA_ROOT}/plugins/interactive/bin` and be sure that are executable.
- Add the two configuration variables inside `${EF_CONF_ROOT}/plugins/interactive/interactive.efconf`:

  - `INTERACTIVE_SESSION_STARTING_HOOK=${EF_DATA_ROOT}/plugins/interactive/bin/sample.alb.session.starting.hook.sh`
  - `INTERACTIVE_SESSION_CLOSING_HOOK=${EF_DATA_ROOT}/plugins/interactive/bin/sample.alb.session.closing.hook.sh`
- Modify the hooks to change the value of the AWS ALB Public DNS name, through the variable `ALB_PUBLIC_DNS_NAME`.
- Configure the AWS role to let the EC2 instance where EnginFrame is running to manage the ALB. From the AWS EC2 Console, select EC2 instance -> Instance Settings -> Attach/Replace IAM Role. The following is just an example, more restrictive rules can be used instead:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "ec2:DescribeInstances",
        "elasticloadbalancing:*"
      ],
      "Resource": "*"
    }
  ]
```

Common errors from the hook execution:

- “An error occurred (AccessDenied) when calling the <xyz> operation: User: <abc> is not authorized to perform <xyz>”. The user running the hook (i.e. the user running the Apache Tomcat® server) is not authorized to perform the required operation. The AWS CLI profile must be configured for that user, having the permissions to list instances and to manage load balancers (see CLI Getting Started) or alternatively, if EnginFrame is installed in an EC2 instance, configure the correct AWS role for that instance.
- Getting "502 Bad Gateway" when connecting to the interactive session. It often means the Target Group of the ALB listener rule is not yet initialized with the target instance. In this case the system usually requires few more instants before establishing the connection with the instance.

Session limits

Number of sessions

The number of interactive sessions can be limited according to:

- the *interactive session class*. An interactive session class is a group of interactive services. Classes defined and customizable by EnginFrame administrators. Interactive classes are defined by setting the following metadata:
  - `INTERACTIVE_CLASS` - an unique identifier for the class.
  - `INTERACTIVE_CLASS_LABEL` - a label for the class (optional).

  The maximum number of interactive sessions for each class is defined by setting `INTERACTIVE_MAX_SESSIONS` parameter. The default value is defined in the *interactive.efconf* configuration file.
- the *interactive service*. Each interactive service can be assigned to a certain class and can define the `INTERACTIVE_MAX_SESSIONS` parameter within its code.
- the *user* or *user group*. With the use of EnginFrame ACLs (Access control lists) combined with the first two items. For detailed documentation about ACLs, please refer to EnginFrame Administrator Guide.

A full example follows:

```
<ef:service id="interactive.xterm">
  <ef:name>XTerm</ef:name>
  <ef:metadata attribute="INTERACTIVE_CLASS">xterm</ef:metadata>
  <ef:metadata attribute="INTERACTIVE_CLASS_LABEL">Xterm</ef:metadata>
  <ef:metadata attribute="INTERACTIVE_MAX_SESSIONS">3</ef:metadata>
  <ef:option id="project" label="Project" type="text">Interactive</ef:option>
  <ef:option id="jobmanager" label="Job Manager" type="list">
    <ef:embed id="grid.plugins"/>
  </ef:option>
  <ef:action id="submit" label="Start" result="text/xml">
    "${EF_ROOT}/plugins/interactive/bin/interactive.submit" \
      --name "XTerm" \
      --os "linux" \
      --jobmanager "${jobmanager}" \
      --project "${project}" \
      --remote "vnc" \
      --vnc-xstartup "${EF_ROOT}/plugins/interactive/conf/metacity.xstartup" \
      --close-on-exit \
      --command "xterm"
  </ef:action>
</ef:service>
```

In the example above, the maximum number of sessions of the "xterm" class will be limited to 3 for each user

Note

Interactive session name and interactive class are not dependent to each other.

Log files

Main interactive log file is located under EnginFrame log directory: `${EF_LOGDIR}/interactive.log`.

All others log files (session, debug, authentication) can be found inside each interactive session spooler, and are available via the portal user interface, by reaching *session details* page.

Interactive Plugin Directory Structure

This section describes the directory structure. Please refer to the EnginFrame Administrator Guide for details about the formats and the purpose of the files.

Interactive Plugin is installed in `${EF_ROOT}/plugins/interactive`.

These are the most important contents of the folder:

```
interactive/
|-- WEBAPP
|-- bin
|-- conf
|   |-- mappers
|   |   |-- interactive.duplicated.sessions.xconf
|   |   `-- interactive.list.sessions.xconf
|   |-- dcv.gpu.balancer.conf
|   |-- dcv2.gpu.balancer.conf
|   |-- gnome.xstartup
|   |-- icewm.xstartup
|   |-- interactive.efconf
|   |-- interactive.vnc.resolutions.conf
|   |-- kde.xstartup
|   |-- log.xconf
|   |-- lxde.xstartup
|   |-- mate.xstartup
|   |-- metacity.xstartup
|   |-- mime-types.xml
|   |-- minimal.xstartup
|   |-- mwm.xstartup
|   |-- nat.conf
|   |-- proxy.conf
|   |-- template.dcv
|   |-- template-dcv2.dcv
|   |-- template.efrgs
|   |-- template.rgreceiver
|   |-- template.vnc
|   |-- xfce.xstartup
|   `-- xfwm4.xstartup
|-- etc
|-- lib
`-- tools
```

Interactive Plugin follows the conventional EnginFrame plug-in structure and in particular the following directories contain Interactive Plugin system files:

- `WEBAPP` - top level service definition files.
- `bin` - scripts and executables.
- `conf` - configuration files.
- `etc` - Interactive Plugin metadata and EnginFrame descriptor files.
- `lib` - internal files used by Interactive Plugin: XML support services and XSL files.
- `tools` - Interactive Plugin integration and interface tools.

Each resource manager plugin supported by Interactive Plugin, includes an *interactive* subdirectory which contains the related interface code with Interactive Plugin:

```
interactive/
|-- interactive.close
|-- interactive.is.session.ready
|-- interactive.log.data
|-- interactive.retrieve.screenshot
|-- interactive.submit
|-- linux.jobscript.functions
`-- services
    `-- interactive.lsf.linux.xml
```

in particular:

- `interactive.submit` - the session submission script.
- `interactive.close` - the operations to be performed to close the session.
- `services` - various service definitions.

Views administration

Virtual Desktop is implemented by the VDI plugin that defines all the services that interact with the backend to provide the high level, user functionalities.

VDI plugin provides a front-end portal that gives EnginFrame administrators an easy way to create, publish and manage Interactive services. End-users instead are provided with a portal to easily access the company Interactive services.

This section explains the configuration files and settings of the VDI plugin.

Topics

Configuration files

Most of the times the values defined during the VDI plugin installation provide all the information necessary to have a working setup. However the administrator may have the need to change the folders where services files are stored or to change other settings of the system.

All the VDI plugin configuration files are located in the `$EF_TOP/<VERSION>/enginframe/plugins/vdi/conf` subdirectory.

Important

As for the other EnginFrame plugins, the correct way to change the default configuration is to copy the target configuration file under the `$EF_TOP/conf`, to the `$EF_TOP/conf/plugins/vdi` directory, if it doesn't already exist, and edit the copied file.

Note

Configuration parameters are automatically loaded upon saving. No need to restart EnginFrame or logout.

Topics

`vdi.conf`

This file contains VDI main default configuration parameters.

Users Access Parameters

`VDI_ALLOW_ALL_USERS`

- value: *required*
- default: *true*

Enables Virtual Desktop access to all the users able to log into the system. If `true`, the users will be added to the VDI default group at login time.

Available values:

- `true` - all user are allowed to access to the Virtual Desktop, i.e. VDI plugin services
- `false` - Virtual Desktop users should be explicitly added or imported by a Views administrator

Example: `VDI_ALLOW_ALL_USERS=true`

`service-manager.efconf`

This file contains VDI plugin configuration parameters useful for service management.

General Parameters

`VDI_SERVICES_ROOT`

- value: *required*
- default: `${EF_DATA_ROOT}/plugins/vdi/services` where `EF_DATA_ROOT` is `$EF_TOP/data`

Sets the root folder where services files are stored. Changing this value, you have to change also

- `sdftree` URL value inside `href` attribute of `xi:include` tags declared in *vdi.xml, vdi.admin.xml* XML files.
- `load-conf` value of `ef:action` tags in the services XML files

Example: `VDI_SERVICES_ROOT=${EF_DATA_ROOT}/plugins/vdi/services`

`SM_TEMPLATES_ROOT`

- value: *required*
- default: `${EF_ROOT}/plugins/vdi/templates`

Sets the root folder where templates files for service creation are stored.

Example: `SM_TEMPLATES_ROOT=${EF_ROOT}/plugins/vdi/templates`

Interactive Services Parameters

`SM_CATALOG_INTERACTIVE`

- value: *required*
- default: *${VDI_SERVICES_ROOT}/catalog*

Sets the folder where unpublished interactive services files are stored.

Example: `SM_CATALOG_INTERACTIVE=${VDI_SERVICES_ROOT}/catalog`

`SM_PUBLISHED`

- value: *required*
- default: *${VDI_SERVICES_ROOT}/published*

Sets the folder where published interactive services files are stored.

Example: `SM_PUBLISHED=${VDI_SERVICES_ROOT}/published`

`interactive.editor.efconf`

This file contains configuration parameters for the interactive service editor in the Virtual Desktop.

Note

In EnginFrame version 2015.0 this file was named `vdi.editor.efconf` and had a slightly different set of configuration parameters.
During the installation of a newer version, EnginFrame makes a copy of the old configuration file under `$EF_TOP/conf/plugins/vdi` directory, naming it as `vdi.editor.efconf.backup`.

Interactive Editor Parameters

`VDI_EDITOR_OS`

- value: *optional*
- default: *windows,linux*

Sets supported operating systems for interactive sessions. Comma separated list without any blank space.

Available values:

- `windows` - Windows® Desktop
- `linux` - Linux® Desktop

Example: `VDI_EDITOR_OS=windows,linux`

`VDI_EDITOR_CLUSTERS`

- value: *optional*
- default: Cluster ids retrieved from system

Sets cluster ids to list on service editor. Comma separated list without any spaces.

Example: `VDI_EDITOR_CLUSTERS=clusterid1,clusterid2`

`VDI_EDITOR_CLUSTERS_ARCH_clusterId`

- value: *optional*
- default: linux for all the clusters id

Sets supported operating systems for interactive sessions scheduled in a specific cluster. Comma separated list without any spaces. `clusterId` is one of the cluster id defined in the `VDI_EDITOR_CLUSTERS` list.

Available values:

- `windows` - Windows® Desktop
- `linux` - Linux® Desktop

Example:

```
VDI_EDITOR_CLUSTERS_ARCH_lsfCluster=linux
VDI_EDITOR_CLUSTERS_ARCH_myCluster=windows,linux
```

`VDI_EDITOR_REMOTES`

- value: *optional*
- default: *dcv2*

Sets the list of supported remote visualization technologies to display in the service editor. Comma separated list without any spaces.

Available values:

- `dcv2` - NICE Desktop Cloud Visualization (since 2017.0)

Example: `VDI_EDITOR_REMOTES=dcv2`

`VDI_EDITOR_REMOTES_ARCH_remoteId`

- value: *optional*
- default: `linux`, `windows` for `vnc`, `dcv` and `dcv2`, `linux` for `virtualgl`

Sets supported session types for a specific remote id. Comma separated list without any spaces. `remoteId` is one of the remote id defined in the `VDI_EDITOR_REMOTES` list.

Available values:

- `windows` - Windows® Desktop
- `linux` - Linux® Desktop
- `linux-app` - Linux® Desktop application

Example: `VDI_EDITOR_REMOTES_ARCH_vnc=linux`

`VDI_EDITOR_DESKTOP_MANAGERS`

- value: *optional*
- default: *none*

Sets the list of supported desktop manager ids to display on the service editor. Comma separated list without any spaces.

For each desktop manager, the name to display could also be specified in the configuration parameter `VDI_EDITOR_DESKTOP_MANAGER_NAME_`*`desktopManagerId`*. If omitted it will be equal to the id.

For each desktop manager, the path to the `xstartup` file must be specified in the configuration parameter `VDI_EDITOR_DESKTOP_MANAGER_XSTARTUP_`*`desktopManagerId`*. Interactive plugin already provides a set of preconfigured xstartup files for supported desktop managers under `${EF_ROOT}/plugins/interactive/conf/` directory.

Example:

```
VDI_EDITOR_DESKTOP_MANAGERS=gnome,kde
VDI_EDITOR_DESKTOP_MANAGER_NAME_gnome=GNOME
VDI_EDITOR_DESKTOP_MANAGER_XSTARTUP_gnome=${EF_ROOT}/path_to_gnome_xstartup
VDI_EDITOR_DESKTOP_MANAGER_XSTARTUP_kde=/path_to_kde_xstartup
```

Log files

Main VDI log file is located under EnginFrame log directory, `${EF_LOGDIR}/vdi.log`, where EF_LOGDIR is `$EF_TOP/logs/<hostname>`.

VDI Plugin Directory Structure

This section describes the directory structure.

VDI plugin is installed in `${EF_ROOT}/plugins/vdi`.

These are the most important contents of the folder:

```
vdi/
|-- WEBAPP
|-- bin
|-- conf
|   |-- authorization.xconf
|   |-- log.xconf
|   |-- service-manager.efconf
|   |-- interactive.editor.efconf
|   `-- vdi.conf
|-- etc
|-- lib
`-- templates
```

VDI follows the conventional EnginFrame plug-in structure and in particular the following directories contain VDI system files:

- `WEBAPP` - top level service definition files and web resources.
- `bin` - scripts and executables.
- `conf` - configuration files.

- `etc` - VDI plugin metadata and EnginFrame descriptor files.
- `lib` - internal files used by VDI plugin: XML support services and XSL files.
- `templates` - Interactive services templates.

Interactive services are installed in `$EF_TOP/data/plugins/vdi/services`.

These are the important contents of the folder:

```
services/
|-- catalog
|-- published
`-- extra
```

The following directories contain VDI plugin services files:

- `catalog` - root folder for unpublished services
- `published` - root folder for published services
- `extra` - root folder for custom extra services to be included in the Virtual Desktop.

Applications administration

Applications plugin provides a front-end portal that gives EnginFrame administrators an easy way to create, publish and manage batch and interactive services. End-users instead are provided with a portal to easily access the company HPC services.

This section explains the configuration files and settings of the Applications plugin.

Important

The service examples provided by the Workspace make use of a `JOB_WORKING_DIR` and assume it is mounted by both EnginFrame hosts and execution hosts.
By default the `JOB_WORKING_DIR` is set to the `EF_SPOOLER` directory of the submitted service, so in order to use the examples the root spoolers directory should be shared with the execution hosts.
This is not a requirement of EnginFrame Workspace but a simplification used by the examples.

Topics

Configuration files

Most of the times the values of the settings collected during the Applications plugin installation provide all the information necessary to have a working setup. However, the administrator may have the need to change the folders where services files are stored or to change other settings of the system.

All the Applications Plugin configuration files are located in the `$EF_TOP/<VERSION>/enginframe/plugins/applications/conf` subdirectory.

Important

As for the other EnginFrame plugins the correct way to change default configuration is to copy the target configuration file under the `$EF_TOP/conf`, to the `$EF_TOP/conf/plugins/applications` directory, if it doesn't already exist, and edit the copied file.

Topics

Note

Configuration parameters are automatically loaded upon saving. No need to restart EnginFrame or logout.

`applications.conf`

This file contains the main default configuration parameters for Applications.

Users Access Parameters

`APPLICATIONS_ALLOW_ALL_USERS`

- value: *required*
- default: *true*

Enables Workspace access to all the users able to log into the system. If `true`, the users will be added to the Applications default group at login time.

Available values:

- `true` - If this value is set, all users are allowed to access to the Workspace.
- `false` - If this value is set, workspace users can be explicitly added or imported by an Applications administrator.

Example: `APPLICATIONS_ALLOW_ALL_USERS=true`

`service-manager.efconf`

This file contains Applications plugin configuration parameters that you can use for service management.

General Parameters

`APPLICATIONS_SERVICES_ROOT`

- value: *required*
- default: *${EF_DATA_ROOT}/plugins/applications/services* where `EF_DATA_ROOT` is `$EF_TOP/data`

Sets the root folder where services files are stored. A change to this value requires that you also make changes to the following:

- `sdftree` URL value inside `href` attribute of `xi:include` tags declared in *applications.xml, applications.admin.xml* XML files
- `load-conf` value of `ef:action` tags in the services XML files

Example: `APPLICATIONS_SERVICES_ROOT=${EF_DATA_ROOT}/plugins/applications/services`

`SM_TEMPLATES_ROOT`

- value: *required*
- default: *${EF_ROOT}/plugins/applications/templates*

Sets the root folder where service templates files are stored.

Example: `SM_TEMPLATES_ROOT=${EF_ROOT}/plugins/applications/templates`

`SM_PUBLISHED`

- value: *required*
- default: *${APPLICATIONS_SERVICES_ROOT}/published*

Sets the root folder where Applications stores files for published services.

Example: `SM_PUBLISHED=${APPLICATIONS_SERVICES_ROOT}/published`

Batch Services Parameters

`SM_CATALOG_BATCH`

- value: *required*
- default: *${APPLICATIONS_SERVICES_ROOT}/catalog/batch*

Sets the folder where unpublished batch services files are stored.

Example: `SM_CATALOG_BATCH=${APPLICATIONS_SERVICES_ROOT}/catalog/batch`

Interactive Services Parameters

`SM_CATALOG_INTERACTIVE`

- value: *required*
- default: *${APPLICATIONS_SERVICES_ROOT}/catalog/interactive*

Sets the folder where unpublished interactive services files are stored.

Example: `SM_CATALOG_INTERACTIVE=${APPLICATIONS_SERVICES_ROOT}/catalog/interactive`

`interactive.editor.efconf`

This file contains configuration parameters for the interactive service editor in the Workspace.

The file syntax and parameters are the same as `interactive.editor.efconf` in the *Views Administration* VDI plugin section.

Log files

The main Applications log file is located under EnginFrame log directory: `${EF_LOGDIR}/applications.log`, where EF_LOGDIR is `$EF_TOP/logs/<hostname>`.

Applications Directory Structure

This section describes the directory structure.

Applications is installed at this location: `${EF_ROOT}/plugins/applications`.

The following are the most important contents of the folder:

```
applications/
|-- WEBAPP
|-- bin
|-- conf
|   |-- authorization.xconf
|   |-- log.xconf
|   |-- service-manager.efconf
|   |-- interactive.editor.efconf
|   `-- applications.conf
|-- etc
|-- lib
`-- templates
```

Applications follows the conventional EnginFrame plug-in structure and, in particular, the following directories contain Applications system files:

- `WEBAPP` - top-level service definition files and web resources.

- `bin` - scripts and executables.
- `conf` - configuration files.
- `etc` - Applications plugin metadata and EnginFrame descriptor files.
- `lib` - internal files that are used by the Applications plugin. They are XML support services and XSL files.
- `templates` - Services templates.

By default, both batch and interactive services are installed at this location: `$EF_TOP/data/plugins/applications/services`.

The following are the most important contents of the folder:

```
services/
|-- catalog
|   |-- batch
|   `-- interactive
|-- published
`-- extra
```

The following directories contain Applications services files:

- `catalog` - root folder for both batch and interactive unpublished services.
- `published` - root folder for published services.
- `extra` - root folder for custom extra services to be included in the Workspace.

Managing spoolers

This chapter provides an overview of the concepts that are related to EnginFrame spoolers and their management.

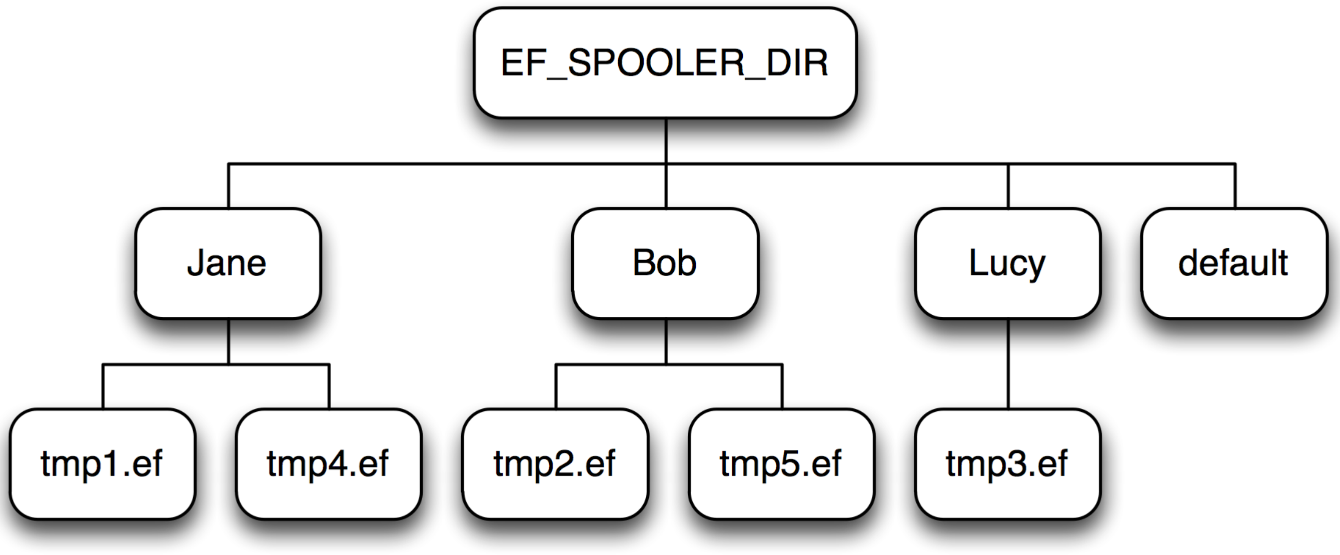
A spooler is a dedicated data container that EnginFrame creates to host files that users provide (for example, input files uploaded using a web browser) or files that are generated by the services (for example, output or temporary files).

Every time the service is run (unless explicitly configured) causes EnginFrame to create a new spooler with appropriate user permissions that allow services to read from and write to spooler's directory.

Under `EF_SPOOLER_DIR`, EnginFrame creates a directory for each user the first time that the system is accessed. These directories are named using the user's names. Under each `<username>` directory, EnginFrame creates its spoolers, one for each time the service is run.

The following image provides a visual overview of EnginFrame's spooler directory structure.

Spoolers directory structure



In the preceding image, `Jane`, `Bob`, `Lucy` each have their own spooler directories. `tmp1.ef`, `tmp2.ef`, `tmp3.ef`, `tmp4.ef`, `tmp5.ef` are spooler directory names that EnginFrame created dynamically.

Spoolers requirements

If agents that use the spoolers run on hosts other than the server hosts, the spoolers must reside on a *shared file system*. This shared file system must be mounted from the EnginFrame Server's host. Both the agents and server must be able to read and write to the shared file system. With theEnginFrame's mapping mechanism, these file systems can be mounted with different paths on server and agent hosts.

Note

If you're using multiple agents, the same mount point path must be used for all of them.

`EF_SPOOLER_DIR` directory must be owned by the user that's running EnginFrame Server (for example, `efnobody`). The same user`efnobody` must have read and write permissions. This is because EnginFrame Server initially creates spoolers for users. All other users must also have read and run permissions for the spooler root directory. In other words, the spooler root directory must have the following ownerships and permissions: `rwx r-x r-x efnobody:efnogroup` where `efnogroup` is `efnobody`'s primary group.

The spoolers area must be placed on a file system where the agent's owner has complete read and write privileges. Depending on who runs agent daemon, this can be achieved by one of the following tactics:

- Avoiding *root squashing* on NFS server when agent owner is *root*.
- Using same user running server when agent owner is a *normal user*.

> **Note**
>
> Distinct EnginFrame deployments can't share the same spooler area.

Spooler security permissions

EnginFrame Server starts with a user file creation mask, such as **umask**, set to `022`. This means the following happens:

- Files are created with 644 `rw-r--r--` permissions.
- Directories are created with 755 `rwxr-xr-x` permissions.

This assures EnginFrame Server user can both read and write files in spoolers. This might lead to a weak security environment because every user can read files from spoolers that are owned by other user accounts. For this reason, EnginFrame Agent changes spooler permissions to 750 `rwxr-x---` just before the service is run. In other words, the final spooler permissions are read, write, and run for the spooler's owner and read and run for EnginFrame Server's owner. This occurs because user `efnobody` with group `efnogroup` creates the spooler. EnginFrame Agent changes spooler's owner by running `chown <username> <spooler>` and spooler ownership becomes `<username>:efnogroup`. This allows the spooler's owner to perform whatever action is needed inside spooler and that only `efnogroup` members are allowed to read data inside spoolers. A security best practice is to have only `efnobody` as `efnogroup` group's member.

Configuring EnginFrame spoolers

This section describes how to customize basic spoolers settings concerning directory paths and file download aspects.

Topics

Configuring spoolers default root directory

`EF_SPOOLER_DIR` directory is chosen during installation. All spoolers are created by EnginFrame under this directory. The default value is `$EF_TOP/spoolers`.

Spoolers root directory can be changed by editing *`EF_SPOOLERDIR`* parameter inside `$EF_TOP/conf/enginframe.conf`. The startup parameter name `EF_SPOOLERDIR` is slightly different from the property `EF_SPOOLER_DIR` that's set and used inside EnginFrame.

Example Change the spooler default root directory

```
EF_SPOOLERDIR=/mnt/scratch/spoolers
```

After this change, all spoolers are created under `/mnt/scratch/spoolers` directory.

Note

Changes to this parameter require an EnginFrame Server restart.

Note

Spooler location is defined at *creation time*, so changing `EF_SPOOLERDIR` doesn't affect an existing spooler's location. EnginFrame Agent retrieves old spoolers from the old location and new spoolers from the new location.

Refer to Spoolers requirements when setting up a new spooler root directory.

Download files from spoolers

File are downloaded from spoolers on the user's behalf through the server and agent. EnginFrame Server receives a download request and forwards it to the agent that accesses the file. The agent posts the file back to server using HTTP or HTTPS.

This process implies EnginFrame Agent is able to connect back to server using HTTP or HTTPS for sending data. As a result, make sure that you are careful with how you configure your network and firewall.

Note

If EnginFrame Server is configured to accept requests through *HTTP over SSL* - HTTPS - protocol, then refer to the Configuring HTTPS topic to configure the server and agent.

Consider setting a *mime-type* for downloaded files to let browsers identify the file's type. You can customize and configure the mime-type that EnginFrame uses when downloading files. Managing internet media types provides instructions on how to set up mime-type configurations.

Configure download URL on agent

The download process highlights how an agent has to connect back to the server for sending downloaded data. Usually the server HTTP endpoint, that is, the host and port that the agent connects to, is automatically detected from server's request.

There might be network configurations or architectural scenarios that require specific configurations. For example, web access might be configured with an HTTP server in front of EnginFrame Server. In this case, the agent must use a different host and port to connect to the server. To enable this, you must explicitly configure the complete URL that the agent must use to connect to the EnginFrame Server.

The `ef.download.server.url` parameter inside `$EF_TOP/conf/enginframe/agent.conf` (or `$EF_TOP/<VERSION>/enginframe/conf/agent.conf`) sets the URL agent uses to connect to server. It's defined as follows:

```
ef.download.server.url=http[s]://<host>:<port>/<web-context>/download
```

Replace the following elements with your specific details:

- The `host` and `port` value identifies the EnginFrame Server network endpoint.
- The `web-context` value is the root context that you chose when installing EnginFrame. By default, it's `enginframe`.

The following is modified with example values for illustration purposes.

```
ef.download.server.url=http://localhost:8080/enginframe/download
```

Configure streaming download timeout

Streaming downloads have a timeout setting. If the file being streamed doesn't change during this set interval of time, EnginFrame interrupts its stream that's being sent to a client. By default, this value is set to `300` seconds.

This value is specified in `$EF_TOP/conf/enginframe/server.conf` (or `$EF_TOP/<VERSION>/enginframe/conf/server.conf`). You change this value by editing `ef.download.stream.inactivity.timeout` property inside `$EF_TOP/conf/enginframe/server.conf`. The value is expressed in seconds.

In the following example, the timeout value is set to `600` seconds (10 minutes).

```
ef.download.stream.inactivity.timeout=600
```

Configure streaming download sleep time

The file streaming download feature of EnginFrame works using a pull model. The server periodically queries an agent for available data.

You can set the specific interval of time between two subsequent checks. By default, it's set to `5` seconds. A lower interval time might improve the user experience but it might also increase system load.

This value is specified in `$EF_TOP/conf/enginframe/server.conf` (or `$EF_TOP/<VERSION>/enginframe/conf/server.conf`). You change this value by editing `ef.download.stream.sleep.time` parameter inside `$EF_TOP/conf/enginframe/server.conf`. The value is expressed in seconds.

For example, with `ef.download.stream.sleep.time=20`, the sleep time is set at `20` seconds.

Spooler life cycle

This section outlines EnginFrame's spooler lifecycle. Besides outlining spooler's lifecycle, each sub-section describes common customizations that you can apply to EnginFrame Portal.

Overview

Spoolers are created for each service submission. More specifically, spoolers are created for all those services whose spooler definition has a TTL different from `-1`.

Spoolers are initially created by EnginFrame Server with a defined time-to-live. Together with spooler directory the server also creates an entry in EnginFrame's spooler database called *repository*. The repository is file-system based and each entry is a file that contains all information that's necessary to recreate a spooler.

- The owner
- The physical location path on both server and agent
- The display name
- And other properties

The server also has the responsibility to save user's files into a spooler before contacting an agent for running a service. After the spooler setup tasks have been accomplished, the server contacts an agent to run the service. The agent first changes the spooler's and its contents ownership and then uses this spooler as the working directory for the service it runs.

EnginFrame removes a spooler when its life-time expires, deleting spooler's directory with its content and its repository entry. An EnginFrame thread called *reaper* periodically checks if there are expired spoolers ready to be removed.

Change repository location

The default EnginFrame repository path is `$EF_TOP/repository`. With EnginFrame, you can change the location of where repository entries are stored.

For example, you might want to save repository entries on a high speed and reliable file-system or on an area that has "dynamic" file-system paths (for example, a directory with contents that change often) to conform to your company's policies.

The repository location is configured by `EF_REPOSITORYDIR` parameter inside the `$EF_TOP/conf/enginframe.conf` file. It specifies an absolute path in the file system. You can use other variables that are defined in `enginframe.conf` for path definition. For example, `EF_REPOSITORYDIR=$EF_TOP/repository` defines repository location using `$EF_TOP` variable. `EF_REPOSITORYDIR=/mnt/nas/ef-repository` sets an absolute path for repository directory.

Note

If you make changes to `EF_REPOSITORYDIR`, you must restart EnginFrame Server.

Configure reaper sleep time

The EnginFrame reaper is a thread that periodically wakes up to check if there are expired spoolers in the system needing cleanup.

You can configure reaper's thread sleep interval to specify how frequently this check is performed.

This value is specified in `$EF_TOP/conf/enginframe/server.conf` (or `$EF_TOP/<VERSION>/enginframe/conf/server.conf`). You change this value by editing the `ef.reaper.sleep.time` property inside `$EF_TOP/conf/enginframe/server.conf` file. The value is expressed in minutes. By default, it's set to `30` minutes.

In this example, `ef.reaper.sleep.time=60`, the sleep time is set to 60 minutes (1 hour) between each thread's reap.

Spoolers removal: Dead spoolers

If for any reason spooler cleanup fails, spooler's directory is renamed with the *DEAD_* prefix added in front of its original name.

For example, if EnginFrame can't remove spooler `tmp32062.ef`, it's renamed to `DEAD_tmp32062.ef`. You can remove dead spoolers from your system safely.

If you set up `deadspooler` logging target after a dead spooler was created, the event is logged to the `$EF_TOP/logs/DEAD_spoolers.{agent|server}.log` depending on whether the server or agent had an error.

Managing the sessions directory

This chapter illustrates the basic concepts that concern EnginFrame interactive session data and its management.

The data of an interactive session is in a dedicated data container. This container is created by EnginFrame to host the files that are required for the interactive session lifecycle. These include the thumbnail of a screenshot, for example.

`INTERACTIVE_SHARED_ROOT` is organized in the same way as the EnginFrame spoolers. For more information, see Managing spoolers. Under `INTERACTIVE_SHARED_ROOT`, EnginFrame creates a directory for each user the first time an interactive session is created. These directories are named with the user's names. Under each `<username>` directory, EnginFrame creates its session data directory, one for each interactive session.

Sessions requirements

Sessions must reside on a *shared file system* that must be mounted from the EnginFrame Server's host, EnginFrame Agent's host and visualization nodes. This area might not require to be shared when submitting sessions to some Distributed Resource Managers. For more information, see Shared file system requirements.

The `INTERACTIVE_SHARED_ROOT` directory must be owned by the user that's running EnginFrame Server (for example, `efnobody`) and by `efnobody`'s primary group. It must have the `3777` permissions. To summarize, the following permissions are required: `d rwx rws rwt efnobody:efnogroup` where `efnogroup` is `efnobody`'s primary group.

The EnginFrame installer creates this directory with the proper permissions on your behalf. The default location is `$EF_TOP/sessions`. You can change the `INTERACTIVE_SHARED_ROOT` value in the `$EF_TOP/conf/plugins/interactive/interactive.efconf` file.

This shared area has to be readable and writable by EnginFrame nodes and visualization nodes. EnginFrame provides a mapping mechanism that enables these file-systems to be mounted with different paths on EnginFrame and visualization hosts. This configuration is specific to the Distributed Resource Manager that's used for the session and can be configured in the specific plugin configuration file:

- On PBS Professional®, use `PBS_INTERACTIVE_SHARED_ROOT_EXEC_HOST` in the `$EF_TOP/conf/plugins/pbs/ef.pbs.conf` file.

- On SLURM™, use `SLURM_INTERACTIVE_SHARED_ROOT_EXEC_HOST` in the `$EF_TOP/conf/plugins/slurm/ef.slurm.conf` file.
- On SGE, use `SGE_INTERACTIVE_SHARED_ROOT_EXEC_HOST` in the `$EF_TOP/conf/plugins/sge/ef.sge.conf` file.

Amazon DCV Session Manager

Amazon DCV Session Manager is a set of installable software packages that includes an Agent and a Broker. It also includes an API that you can use to build frontend applications that create and manage the lifecycle of Amazon DCV sessions across a fleet of Amazon DCV servers.

The Amazon DCV Session Manager integration is only supported with Amazon DCV 2020.2 and later.

Node monitoring, Linux console sessions, autorun files, and sessions screenshots are new features that were introduced in Amazon DCV 2021.0. These features have been added in EnginFrame 2020.1 and are only supported by Amazon DCV 2021.0 and later.

For more information, see What is Amazon DCV Session Manager in the *Amazon DCV Session Manager Administrator Guide*.

How to set up Amazon DCV Session Manager

When you install EnginFrame, you can choose to use Amazon DCV Session Manager to manage DCV sessions.

To allow EnginFrame to interact with Amazon DCV Session Manager, register EnginFrame as a Session Manager API client.

If you don't have a client ID and client password for EnginFrame, you must request these credentials from your Amazon DCV Session Manager Broker administrator. For more information about registering your client API with the Broker and obtaining a client ID and password, see register-api-client in the *Amazon DCV Administrator Guide*.

To properly configure the Amazon DCV Session Manager, the installer requires the following information:

- The base URL of the remote Amazon DCV Session Manager. This URL is used by EnginFrame to manage DCV sessions.

- The full URL, client ID, and client password that EnginFrame uses to authenticate with the Broker.

The installer stores this information in the following locations:

- `$EF_CONF_ROOT/plugins/dcvsm/clusters.props`.

  This file contains sensitive information that's used to authenticate to remote Amazon DCV Session Managers. Because of the potential for abuse, this file must have strict permissions. We recommend that you only grant read and write permissions for the user that is running the Apache Tomcat® server. Do not make this file accessible to other users.

  `-rw------- efnobody efnobody`.
- `$EF_CONF_ROOT/plugins/dcvsm/dcvsm.efconf`.

  This is the configuration file. It contains the configuration for the Amazon DCV Session Manager plugin integration and includes sensitive information.

The following is an example `clusters.props` file.

```
#
# This file has been created during EnginFrame installation.
# It contains only the installation specific settings.
#
# This file contains sensitive data and should be readable by the user running
# EnginFrame but not accessible by others (read/write/execute).
# EnginFrame will refuse to load this file if it is accessible by others.

# Configuration for cluster cl1
DCVSM_CLUSTER_dcvsm_cl1_AUTH_ID=clientID
DCVSM_CLUSTER_dcvsm_cl1_AUTH_PASSWORD=clientPassword
DCVSM_CLUSTER_dcvsm_cl1_AUTH_ENDPOINT=https://sm-hostname:sm-port/oauth2/token
DCVSM_CLUSTER_dcvsm_cl1_SESSION_MANAGER_ENDPOINT=https://sm-hostname:sm-port
DCVSM_CLUSTER_dcvsm_cl1_NO_STRICT_TLS=false
```

The following is an example of the `dcvsm.efconf` file.

```
# This file has been created during EnginFrame installation.
# It contains only the installation specific settings.
#
DCVSM_CLUSTER_IDS=dcvsm_cl1
```

The name of the cluster that's reported in `DCVSM_CLUSTER_IDS` must match the name that's used for the properties that are described in `clusters.props`. If this isn't the case, EnginFrame can't retrieve the cluster configuration parameters.

Add more Amazon DCV Session Manager clusters

To add more clusters, you can use the EnginFrame installer. It creates Amazon DCV Session Manager clusters that use a default configuration. You can change these settings after the cluster is created.

For each new cluster, the following is required:

- A new clusterId must be added in `DCVSM_CLUSTER_IDS` (in a comma separated list) in `$EF_CONF_ROOT/plugins/dcvsm/dcvsm.efconf`.
- A new set of parameters must be added in `$EF_CONF_ROOT/plugins/dcvsm/clusters.props`.

Enable hosts monitoring for Amazon DCV Session Manager

By default, Amazon DCV Session Manager hosts are not shown in the *Hosts* section of the portal. To enable this feature, edit two configuration files to meet the following requirements:

- The `dcvsm` string must be added in `EF_GRID_MANAGERS` (comma separated list) in `$EF_CONF_ROOT/plugins/grid/grid.conf`.
- The `dcvsm` string must be added in `GRID_XML_PLUGINS` (comma separated list) in `$EF_ROOT/plugins/grid/conf/jobcache.efconf`.

After you change these properties, you must restart EnginFrame to apply the changes.

Amazon DCV Session Manager secure connection configuration

By default, the installer configures a secure connection using strict TLS checking between EnginFrame and the Amazon DCV Session Manager Broker. We recommend that you use this default configuration.

If you so choose, you can disable this behavior by setting `DCVSM_CLUSTER_clusterID_NO_STRICT_TLS` to `true` in the `clusters.props` configuration file.

If a valid certificate is presented, EnginFrame trusts the DCV Session Manager Broker.

If the Amazon DCV Session Manager Broker is configured to use self-signed certificates, make sure that the root certificate is added to the Tomcat JVM KeyStore.

For instructions on how to add a root certificate to the Tomcat JVM KeyStore, see Configuring HTTPS.

In the following example, the `CA_ROOT.pem` file that's provided by the Amazon DCV Session Manager Broker is used.

```
# 1. export the Session Manager CA Certificate in der format with openssl
openssl x509 -in CA_ROOT.pem -inform pem -out ca.der -outform der

# 2. Verify that Java Keytool is able to read the certificate
keytool -v -printcert -file ca.der

# 3. import Session Manager CA Certificate in JVM keytool
keytool -importcert -alias dcvsm \
        -keystore $JAVA_HOME/lib/security/cacerts \
        -storepass java_keystore_password \
        -file ca.der

# 4. verify that the root certificate has been imported
keytool -keystore "$JAVA_HOME/lib/security/cacerts" \
        -storepass java_keystore_password \
        -list | grep dcvsm
```

How to create a new remote desktop interactive service

An Admin user can create a new remote interactive service using Amazon DCV Session Manager from the Virtual Desktop portal.

A Amazon DCV Session Manager cluster supports both Windows and Linux hosts.

Session modes

The interactive plugin with Amazon DCV Session Manager, creates `VIRTUAL` or `CONSOLE` sessions in Linux hosts and `CONSOLE` sessions in Windows hosts. For more information about session types and support, see Amazon DCV Session Manager documentation.

`CONSOLE` sessions support one or more session per instance. This is the default for Windows hosts. You can create a maximum of 3 Windows sessions because there only 3 instances deployed.

`VIRTUAL` sessions support only one sessions per instance. This is the default for Linux hosts.

Important

`VIRTUAL` and `CONSOLE` sessions can't be active on the same host at the same time.

Create a remote desktop interactive service

Create and publish a remote desktop interactive service

1. Open the EnginFrame portal and **Login** as Admin user.
2. Choose the **Virtual Desktop**.
3. Choose **Switch to Admin View** in the header navigation pane.
4. In the sidebar navigation pane, choose **Manage** and then **Interactive Services**.
5. Choose **New** to create an interactive service.
6. Select **Create from Template** and choose **Create**.
7. Choose **Settings**. Here you can customize your service. Choose **Close** to skip to the next step.
8. In the yellow box, type in a new name for your service, such as "MyService".
9. Choose **Launch Session**.
10. Review and keep the settings, including the **Session Mode** in the **Execution Environment** section.

11. Choose **Close**, **Save**, and **Close**.
12. To modify or test the service, select your new service and choose **Edit**.
13. To publish the service, select your new service and choose **Publish**, then select **All Users** and **Publish**.
14. Choose **Switch to User View** in the header navigation pane.
15. Your new remote interactive service is displayed under **Services** and available for use.

Using Amazon DCV Session Manager, you can tag the host where the DCV Server is running with custom values. You can also use these values to select which host the session is created on. For more information, see the Amazon DCV Session Manager documentation.

With EnginFrame session placement, you can create an interactive service that targets hosts with specific characteristics. Using this feature, you don't need to recall specific details such as the hostname or IP address and delegate their discovery to the remote Amazon DCV Session Manager Broker.

To specify a set of "tags" for targeting the host, add the `submitopts` option in the `ActionScript` tab:

```
vdi.launch.session --submitopts " ram_gb='4' Software='My Software' "
```

- Multiple tags can be specified, separated by spaces.
- Each tag is a key-value pair that's in the format of "key=value". There can't be any spaces before and after the equal sign (=) unless the keys and values are wrapped in single quotes (').

If no hosts are available, the session fails to be created. This can happen if there is no hosts or if all the hosts are in use and aren't available to create the session.

EnginFrame 2020.1+ provides the possibility to specify a custom `Autorun File` to be run when a session is created. The file must be present on the remote host within a reserved folder. For more information about autorun files, see Amazon DCV Session Manager documentation.

This feature is only compatible with Amazon DCV Session Manager 2021.0+ on `CONSOLE` sessions on Windows Amazon DCV servers and `VIRTUAL` sessions on Linux Amazon DCV servers. It is not supported with `CONSOLE` sessions on Linux Amazon DCV servers.

To specify the `Autorun File`, add the `delegate-autorun-file` option in the `ActionScript` tab. You can do this by running the following command.

```
vdi.launch.session --delegate-autorun-file "autorun/relative/file/path.sh"
```

Restarting Amazon DCV Session Manager

By default, the Amazon DCV Session Manager Broker is configured with `enable-persistence=false` in the `session-manager-broker.properties` configuration file. If you restart the Amazon DCV Session Manager with this default Amazon DCV Session Manager Broker setting, the list of sessions and servers are lost until all of the Amazon DCV Session Manager agents repopulate the information for the broker.

To avoid issues with EnginFrame while running, restart the Amazon DCV Session Manager Broker by taking the following steps.

1. Stop the EnginFrame service and verify that the EnginFrame processes are killed: `ps -f | grep enginframe`.
2. Restart the Amazon DCV Session Manager Broker.
3. Wait at least 5 minutes and make sure that all of the agents have communicated with the Amazon DCV Session Manager Broker. Verify by running the `dcvsm describe-servers` and `dcvsms describe-sessions` commands.
4. Restart the EnginFrame service.

You can also avoid this issue by setting `enable-persistence=true` in the `session-manager-broker.properties` configuration file. For more information, see Configuring broker persistence in the *Amazon DCV Session Manager Administrator Guide*.

Plugin limitations

Custom `Init Scripts` aren't supported. Linux virtual sessions use the default scripts that are provided by Amazon DCV.

Sessions can be shared only with `Collaborators`. There is currently no support for sharing with `Viewers`.

Troubleshooting

Compatibility with Amazon DCV versions

EnginFrame 2020.1 added several new features. These included node monitoring, Linux console sessions, autorun files, and session screenshots. These features only work with Amazon DCV 2021.0 and later. They do not work with earlier versions. To use these features and avoid issues of incompatibility, upgrade to a compatible version.

If you try to use these features with an earlier version, an error like the following might occur.

```
SMClient.getSessionScreenshot: If you are not using DCVSM 2021.0+,
    please be aware that getSessionScreenshot is not supported.
    Protocol version: 2020.2
```

Log files

The main Amazon DCV Session Manager plugin log file is located under the EnginFrame log directory that's named `${EF_LOGDIR}/dcvsm.log`.

Managing AWS HPC Connector

HPC Connector requires AWS CLI version 2 and AWS ParallelCluster 3.0.2 or later to be pre-installed on the node that's running the EnginFrame server. This means that the user `efnobody` running the EnginFrame Server must have access to the package and permissions to run the `pcluster` command.

Before you install EnginFrame, make sure that AWS ParallelCluster is installed by running the following command as the user `efnobody` that is running the EnginFrame server.

```
$ pcluster version
```

The output is as follows:

```
{
  "version": "3.0.2"
}
```

For instructions on how to set up and configure AWS ParallelCluster, see the AWS ParallelCluster guide. This setup includes setting up required dependencies. Among these dependencies, NodeJS must be accessible to the user `efnobody` that's running the EnginFrame server.

We recommend that you install AWS ParallelCluster in a Python virtual environment. This avoids requirement version conflicts with other Python packages.

Activating an AWS ParallelCluster virtual environment

You must reactivate the virtual environment with every restart. As a result, we recommended that you add it in your `init` environment file (for example, `~/.bashrc`) for the user.

```
source [YOUR_VIRT_ENV_PATH]/bin/activate
```

Before installing EnginFrame with AWS HPC Connector

To start HPC Connector, the EnginFrame installer requires the following parameters:

- An AWS Region where the cluster is created and managed.
- An Amazon S3 bucket to transfer data between EnginFrame and the remote clusters.
- Three IAM roles that are used to access data on the S3 bucket, submit jobs using SSM, and manage clusters using AWS ParallelCluster.
- An AWS instance profile or an AWS profile name containing AWS credentials for an IAM user (`<ef-iam-user>`) able to assume the roles.

To simplify the setup of these resources, you can use a deployment script to create the required resources on your AWS account. Select one of the following links to bootstrap AWS HPC Connector.

- US East (N. Virginia) Region
- US East (Ohio) Region
- US West (N. California) Region
- US West (Oregon) Region
- Canada (Central) Region
- Europe (Frankfurt) Region
- Europe (Ireland) Region

- Europe (Stockholm) Region
- Europe (Milan) Region
- Asia Pacific (Tokyo) Region
- Asia Pacific (Seoul) Region
- Asia Pacific (Hong Kong) Region
- Asia Pacific (Mumbai) Region

AWS credentials and profile

HPC Connector requires users to have a valid set of credentials for `<ef-iam-user>` that are stored in the `.aws/credentials` file of the user `efnobody` that's running the EnginFrame server. Make sure that the credential file has an entry that's similar to the following example.

```
[<profile-name>]
aws_access_key_id=<aws access key for the account>
aws_secret_access_key=<aws secret access for the account>
```

EnginFrame assumes that this credential file is already present at installation time, and that a profile with the name that's provided during setup is already present. It asks for the profile name that's used for creating the clusters, and performs a check on the credentials file. If no file is present or if a profile with the given profile name is not present, the installer logs a warning and continues its operation, assuming that the profile will be created at a later time.

Amazon S3 bucket for data transfer

When launching a job on a cluster running on AWS, HPC Connector uses an Amazon S3 bucket to transfer input and output data to from the remote folder where the job is to run. To use the Amazon S3 bucket, you must provide the Amazon resource name (ARN) of the S3 bucket when using the EnginFrame installer.

Warning

- In general, the overall size of a file that's transferred for a single job doesn't need to exceed 100MB. If the overall file size exceeds 100MB, the system might time out on the transfer operation, and the job or copy might fail. If your jobs need to access larger datasets, make sure that these are available to the cluster through a shared file system.

For more information about how to mount shared storage, see Shared storage in the AWS ParallelCluster User Guide.

- HPC Connector doesn't support Using Amazon S3 bucket keys.

HPC Connector IAM roles

AWS HPC Connector uses AWS Identity and Access Management (IAM) roles to control permissions that are associated with the AWS resources that are deployed to a selected AWS account. HPC Connector runs multiple operations on the selected AWS account. It creates and manages clusters using AWS ParallelCluster commands. It also submits and manages jobs on remote clusters, and transfers input and output data between clusters and the EnginFrame spoolers. HPC Connector uses different roles to limit the scope to the minimum permissions required for each operation.

- An IAM role for managing AWS ParallelCluster (`ef-parallelcluster-role`) in your account. This role is used by HPC Connector for creating, starting, and stopping clusters. It must have AWS ParallelCluster's policies attached for managing the clusters.
- An IAM role for accessing the Amazon S3 bucket (`ef-s3-role`). This is used by HPC Connector for transferring the data back and forth from the remote destination. This role has a policy (`ef-s3-role-policy`) that's attached for accessing the Amazon S3 bucket and reading or writing objects.
- An IAM role for running jobs remotely using SSM (`ef-ssm-role`). This is used for launching job scripts remotely on the clusters. This role has a policy (`ef-ssm-role-policy`) that's attached for sending commands to the remote instances.

You can create IAM policies and roles to control the permissions that are granted to HPC Connector and to the users of the cluster. The following examples show the IAM policies and roles that are required to use HPC Connector. In the policies, replace `aws-account-id` and similar strings with the appropriate values.

Note

The following examples include Amazon Resource Names (ARNs) for the resources. If you're working in the AWS GovCloud (US) or AWS China partitions, the ARNs must be changed. Specifically, they must be changed from "arn:aws" to "arn:aws-us-gov" for the AWS GovCloud (US) partition or "arn:aws-cn" for the AWS China partition. For more information, see Amazon Resource Names (ARNs) in AWS GovCloud (US) Regions in the *AWS GovCloud*

(US) User Guide and ARNs for AWS services in China in *Getting Started with AWS services in China*.

AWS ParallelCluster IAM policy and role

HPC Connector uses AWS ParallelCluster to provision clusters and must have access to both the Base user policy required to invoke AWS ParallelCluster features and the policy for Privileged IAM access mode.

For more information how to create the policy, see AWS Identity and Access Management roles in AWS ParallelCluster 3.x.

The AWS ParallelCluster IAM role then needs to be configured with the following trust relationship to allow EnginFrame to use it:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Principal": {
        "AWS": "arn:aws:iam::<aws-account-id>:user/<ef-iam-user>"
      },
      "Action": "sts:AssumeRole"
    }
  ]
}
```

SSM IAM policy and role

The following policy shows the permissions that are required by HPC Connector to run SSM commands for managing jobs.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "ssm:SendCommand"
            ],
            "Resource": [
                "arn:aws:ec2::<aws-account-id>:instance/*"
            ],
            "Condition": {
                "StringLike": {
                    "ssm:resourceTag/parallelcluster:node-type": ["HeadNode"]
                }
            }
        },
        {
            "Effect": "Allow",
            "Action": [
                "ssm:SendCommand"
            ],
            "Resource": [
                "arn:aws:ssm:::document/AWS-RunShellScript"
            ]
        },
        {
            "Action": [
                "ssm:GetCommandInvocation"
            ],
            "Effect": "Allow",
            "Resource": "*"
        }
    ]
}
```

Create the policy, assign it a name (`ef-ssm-role-policy`) and attach it to an IAM role (for example, `ef-ssm-role`). The policy requires all the instances to have a specific tag that's assigned automatically by AWS ParallelCluster to head nodes. This prevents arbitrary SSM commands from running on instances that aren't head nodes. Then configure it with the following trust relationship to allow EnginFrame to use it:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Principal": {
        "AWS": "arn:aws:iam::<aws-account-id>:user/<ef-iam-user>"
      },
      "Action": "sts:AssumeRole"
```

```
        }
    ]
}
```

Amazon S3 IAM policy and role

The following policy shows the permissions that are required by HPC Connector to move files between the EnginFrame node and remote spoolers using Amazon S3. Replace `<s3-bucket>` with the actual Amazon S3 bucket name.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Action": [
                "s3:ListBucket"
            ],
            "Resource": [
                "arn:aws:s3:::<s3-bucket>"
            ],
            "Effect": "Allow"
        },
        {
            "Action": [
                "s3:PutObject",
                "s3:GetObject",
                "s3:DeleteObject"
            ],
            "Resource": [
                "arn:aws:s3:::<s3-bucket>/*"
            ],
            "Effect": "Allow"
        }
    ]
}
```

Create the policy, assign it a name (for example, `ef-s3-role-policy`), and attach it to an IAM Role (`ef-s3-role`). Then configure it with the following trust relationship to allow EnginFrame to use it:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
        "Effect": "Allow",
        "Principal": {
            "AWS": "arn:aws:iam::<aws-account-id>:user/<ef-iam-user>"
        },
        "Action": "sts:AssumeRole"
    }
  ]
}
```

Access to the Amazon S3 bucket is required only by the head nodes of the remote clusters. Therefore, you must add a condition that limits the access only to the instance policies that are created by AWS ParallelCluster. This can be done by specifying a condition on the IAM role (`ef-s3-role`).

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
        "Effect": "Allow",
        "Principal": {
            "AWS": "arn:aws:iam::<aws-account-id>:root"
        },
        "Action": "sts:AssumeRole",
        "Condition": {
            "StringLike": {
            "AWS:PrincipalArn": "arn:aws:iam::<aws-account-id>:role/parallelcluster/
*"
            }
        }
    }
  ]
}
```

EnginFrame IAM user

An `<ef-iam-user>` must be configured with the following policy that allows it to assume the previously defined AWS ParallelCluster, Amazon S3, and SSM roles.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Action": "sts:AssumeRole",
            "Resource": "arn:aws:iam::<aws-account-id>:role/<ef-parallelcluster-
role>",
            "Effect": "Allow"
        },
        {
            "Action": "sts:AssumeRole",
            "Resource": "arn:aws:iam::<aws-account-id>:role/<ef-s3-role>",
            "Effect": "Allow"
        },
        {
            "Action": "sts:AssumeRole",
            "Resource": "arn:aws:iam::<aws-account-id>:role/<ef-ssm-role>",
            "Effect": "Allow"
        }
    ]
}
```

AWS ParallelCluster configuration requirements

Topics

Required additional IAM policies

AWS HPC Connector requires AWS ParallelCluster configurations to have specific additional policies attached to the IAM role used for the head node. Most specifically, as the job submission uses SSM, the `AmazonSSMManagedInstanceCore` must be attached to the additional policies. In addition to SSM, the head node must also assume the role that's needed by HPC Connector to transfer the files back and forth.

AWS ParallelCluster head node policy

AWS ParallelCluster configurations must include a role policy for the cluster head node (`parallelcluster-ef-instance-policy`) to allow data transfer to and from the regional Amazon S3 bucket. Be aware that the name of the policy must start with the parallelcluster prefix in order for it to be attached to the head node.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Action": "sts:AssumeRole",
            "Resource": "arn:aws:iam::<AWS ACCOUT ID>:role/<ef-s3-role>",
            "Effect": "Allow"
        }
    ]
}
```

The policies (both the head node policy and the SSM managed instance core policy) must be present in your configuration in order for the cluster to be managed by HPC Connector

```
HeadNode:
  Iam:
    AdditionalIamPolicies:
     - Policy: arn:aws:iam::aws:policy/AmazonSSMManagedInstanceCore
     - Policy: arn:aws:iam::<account-id>:policy/<parallelcluster-ef-instance-policy>
```

Scoping down HPC Connector

HPC Connector allows running SSM commands only to head nodes. It does this by using the `parallelcluster:node-type` tag added automatically by AWS ParallelCluster when it provisions a new head node instance. This restriction is specified in the SSM policy that is required by HPC Connector to work properly. However, the default policy HPC Connector can access any head node, even if it wasn't created specifically by HPC Connector itself. This can be further scoped down by specifying a different tag name and value in the SSM policy (`ef-ssm-role-policy`) and having AWS ParallelCluster set that tag on the head node by adding a Tags section in the configuration file. For instance, for setting a tag named `ef:instance` to the remote value, the following section can be added in AWS ParallelCluster’s configuration file.

```
Tags:
  -Key: ef:instance
  Value: remote
```

Managing clusters

The management of clusters in EnginFrame is performed within two distinct views that are available in the Admin View section of EnginFrame.

- The AWS Cluster Configurations view, which manages AWS ParallelCluster configurations.
- The Clusters view, which shows all of the running clusters accessible by EnginFrame.

AWS Cluster Configurations page

The AWS Cluster Configurations page displays all the AWS ParallelCluster configurations that administrators have imported in EnginFrame. The configurations define all the properties of a cluster on AWS, including queues, compute resources, and shared storage. HPC Connector only supports AWS ParallelCluster 3 template files as cluster configurations. In this view administrators can register new cluster configurations, rename and delete them, and launch new clusters based on that configuration. The following sections will provide instructions on how to operate on the AWS Cluster Configurations page.

List the AWS Cluster Configurations

1. Log in to the Workspace as a user with administrator privileges.
2. To open the Admin view, on the top-right corner choose **Switch to Admin View**.
3. Under the **Manage** section in the left menu, select **AWS Cluster Configurations**.

Register an AWS Cluster Configuration

Note

Before registering an AWS ParallelCluster configuration, make sure it complies with the HPC Connector requirements. For more information, see AWS ParallelCluster configuration requirements.

1. Log in to the Workspace as a user with administrator privileges.

2. To open the Admin’s portal, on the top-right corner choose **Switch to Admin View**.
3. Under the **Manage** section in the left menu, select **AWS Cluster Configurations**.

   The list of the cluster configurations is displayed in the table.
4. Choose **Register** at the top of the table.
5. In the **Register Cluster Configuration** box, fill in the fields:
   - **AWS ParallelCluster configuration** — Choose between “Upload file” and “Paste text”
   - **Upload file** — Select a valid AWS ParallelCluster configuration file
   - **Paste text** — Enter a valid AWS ParallelCluster configuration file in the textbox.
6. Choose **Register**.

Rename an AWS Cluster Configuration

- Log in to the Workspace as a user with administrator privileges.
- To open the Admin’s portal, on the top-right corner choose **Switch to Admin View**.
- Under the **Manage** section in the left menu, select **AWS Cluster Configurations**.

  The list of the cluster configurations is displayed in the table.
- Select the **Actions** drop-down menu on your chosen configuration.
- Choose **Rename**.
- Add the new configuration name.
- Choose **Rename** to submit the new name. The new name will be visible in the configuration list after a few moments.

Delete an AWS Cluster Configuration

- Log in to the Workspace as a user with administrator privileges.
- To open the Admin’s portal, on the top-right corner choose **Switch to Admin View**.
- Under the **Manage** section in the left menu, select **AWS Cluster Configurations**.

  The list of the cluster configurations is displayed in the table.
- Select the **Actions** menu on your chosen configuration.
- Choose **Delete** action from the dropdown.

- Choose **OK** to confirm deletion. The configuration will be removed from the configuration list after a few moments.

Start a new cluster from an AWS Cluster Configuration

- Log in to the Workspace as a user with administrator privileges.
- To open the Admin's portal, on the top-right corner choose **Switch to Admin View**.
- Under the **Manage** section in the left menu, select **AWS Cluster Configurations**.

  The list of the cluster configurations is displayed in the table.
- Select the **Actions** menu on your chosen configuration.
- Choose **Create Cluster** action from the menu.
- Enter the **Cluster Name** field with your preferred cluster name.
- For **User Mode**, choose **Single user** or **Multi User 1:1**.
- Choose **Create** to submit the cluster creation.
- Creating the new cluster might require a few minutes. During that time, the state of the cluster in the cluster list page will change upon refresh. When a cluster is ready to be used its status will transition to **Ready** on the **Clusters** page.

Clusters page

The Clusters view contains all the clusters from all the grid managers that are linked to EnginFrame. For each cluster, we show the name, the scheduler, the type (Local or AWS Cloud), the list of available queues, and the cluster status. Only clusters with the status Ready can serve traffic and be used for job submission.

By choosing the **Actions** arrow that appears hovering on a row, some functionalities are shown on clusters with type AWS Cloud. Depending on the state of the cluster, you can choose one or more actions between Start, Stop, Delete, Rename, and Share.

- The **Start** action is used to start the head node of a specific cluster.
- The **Stop** action is used to stop the head node of a specific cluster. A stopped cluster can't serve traffic until it is started again.
- The **Delete** action is used to completely delete all the resources related to the cluster itself. After a cluster is deleted, it isn't possible to recover it. A new cluster must be created from the

same configuration. Take extra caution when deleting a cluster, and ensure that data has been appropriately synced prior to deleting a cluster.

- The **Rename** action is used to redefine the label associated with the cluster. This label is used to refer to the cluster in other EnginFrame views, such as the Service Editor list. Changing the cluster label doesn't affect the cluster operation or the related AWS CloudFormation stack. Changing the label automatically updates any service that had previously referred to it as well.
- The **Share** action gives visibility of a cluster to a specific set of user or groups. By default, only Administrators can see AWS Cloud clusters. When choosing **Share**, a dialog opens where you can select which users can submit jobs on the cluster. After choosing **Share**, the previous share settings are overridden. More specifically, you can choose one of the following options:
  - Only Administrators
  - All Users
  - Selected groups (here you must select one or more of the groups that you see in the specific area of the dialog.)

List the existing clusters

1. Log in to the Workspace portal as a user with administrator privileges.
2. In the menu, select **Switch to Admin View**.
3. In the navigation pane, under **Infrastructure**, select **Clusters**.

If the cluster is an AWS ParallelCluster cluster, its type is AWS Cloud. The allowed actions might vary based on the type and current status of the cluster.

Start a cluster

- Log in to the Workspace portal as a user with administrator privileges.
- In the menu, select **Switch to Admin View**.
- In the navigation pane, under **Infrastructure**, select **Clusters**.
- Select the **Actions** menu on your chosen configuration.
- Choose **Start**.

  After the **Start** action is selected, users can't see the cluster in their list until the cluster transitions into the **Ready** state.

Stop a cluster

- Log in to the Workspace portal as a user with administrator privileges.
- In the menu, select **Switch to Admin View**.
- In the navigation pane, under **Infrastructure**, select **Clusters**.
- Select the **Actions** menu on your chosen configuration.
- Choose **Stop**.

  The cluster isn't available to the users immediately. After a few moments, it transitions into the **Stopped** state.

Delete a cluster

- Log in to the Workspace portal as a user with administrator privileges.
- In the menu, select **Switch to Admin View**.
- In the navigation pane, under **Infrastructure**, select **Clusters**.
- Select the **Actions** menu on your chosen configuration.
- Choose **Delete**.

> **Note**
>
> The cluster must be in a **Stopped** state before it's deleted.

- Choose **Yes** on the confirmation dialog.
- The selected cluster is deleted after a few minutes, and all its resources are removed. After this is complete, the cluster transitions into the **Deleted** state. By default, the entry is removed from the list after one day.

Share a cluster

- Log in to the Workspace portal as a user with administrator privileges.
- In the menu, select **Switch to Admin View**.
- In the navigation pane, under **Infrastructure**, select **Clusters**.
- Select the **Actions** menu on your chosen configuration.
- Choose **Share**.

A window opens where you can select users to share the cluster with.

- Specify the users to share the cluster with: Only Administrators, All Users, or Selected Groups.
- Choose **Save**.

  When the dialog is closed, the new configuration is applied to the cluster, and it's visible to the specified users or groups depending on its state.

> **Note**
>
> Only clusters in the **Ready** state are visible to the users.

Rename a cluster

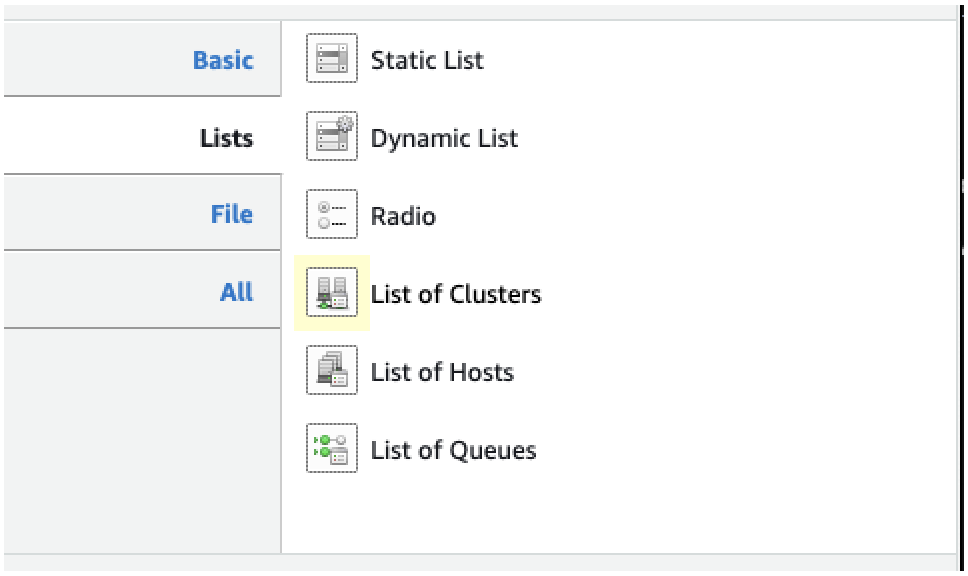
- Log in to the Workspace portal as a user with administrator privileges.
- In the menu, select **Switch to Admin View**.
- In the navigation pane, under **Infrastructure**, select **Clusters**.
- Select the **Actions** menu on your chosen configuration.
- Choose **Rename**.
- Enter a new cluster name in the window.
- Choose **Rename**.
- The list of clusters is updated after a few moments with the new name chosen for the cluster.
- In the **Rename Cluster** box, enter the preferred name in the **Cluster Name** field.
- Choose **Rename**.

Current limitations

HPC Connector supports only jobs that are related to the same cluster in a spooler.

Managing jobs

To manage a job using HPC Connector, you must specify the cluster where you want to submit a given job. For this purpose, the service editor allows users to select a cluster by means of the cluster list component. The component shows the list of clusters that are shared with a given user.



On the action script part of your service, the usual `application.submit` action is required to have a `--cluster` option where the selected cluster can be specified. For HPC Connector to submit jobs remotely, the `--jobmanager` parameter must be set to the `hpc` value.

A cluster can be specified programmatically using the cluster ID rather than the name. The cluster ID information is available in the details page of a cluster. This page is reachable by selecting the name for a given cluster in the clusters page.

Validating a remote job submission

HPC Connector has a mechanism that copies the local data that's required to submit a job remotely. However, this mechanism is limited to the use of small files, which can't exceed 100MB overall.

If you run jobs with different requirements in terms of file size, a different approach is required depending on the specific scenario. AWS provides several solutions for synchronizing data on-premises remotely. Solutions such as AWS DataSync or AWS Storage GateWay, for example, can be used for creating tailor made solutions.

Regardless of the synchronization approach adopted, it might happen that the content required on the cloud isn't up to date with the equivalent content on-premises due to eventual consistency. In these scenarios, it's useful for a service to fail fast upon a validation check performed before submitting the job to a remote cluster.

The `HPCC_VALIDATION_SCRIPT_PATH` environment variable allows administrators to specify the path of an executable that is launched before a job is submitted remotely. The executable has access to all the environment set for the job and therefore can validate if a given job has all the necessary resources for running properly: project files, users, permissions.

A validation script is required to return one of two states.

- `SUCCESS` indicates that the validation succeeded and that the job is therefore allowed to continue its submission process remotely.
- `FAILURE` indicates an issue in the synchronization and cancels the job submission. A canceled job can then be repeated by the user at a later time.

Any value that's returned different from `SUCCESS` or `FAILURE` is interpreted by HPC Connector as a failure and HPC Connector cancels the job submission.

Note

The validation script is meant to perform only a validation of the requirements for job submission. It's not meant as a way for transferring data from on-premises. Due to its scope, it's meant to be run in a short timeframe that's no more than 10 seconds. Having a validation script that takes near to the 10 second quota to run might cause performance issue in EnginFrame that impacts the whole system.

Customizing logging

Logging is an integral component to any software development project. During the development stages it offers a valuable source of debugging information for the developer. During deployment it can provide valuable operational data that allows administrators to diagnose problems as they arise.

Tomcat® logging

EnginFrame comes with Apache Tomcat® servlet container. Tomcat® log files are the first source of information concerning EnginFrame's status. Log files are located on EnginFrame Server's host under `$EF_TOP/logs/<HOSTNAME>/tomcat`.

These are the most interesting log files:

- `catalina.out`

Contains Tomcat®'s Java™ process standard output and standard error. Tomcat® startup and shutdown messages are written here.

- `catalina.[yyyy]-[mm]-[dd].log`

  Contains Tomcat®'s and its libraries logging information on a day-by-day basis.

- `localhost_access_log.[yyyy]-[mm]-[dd].txt`

  Contains all web accesses on a day-by-day basis. Any resource served by Tomcat is logged here with information about the amount of transferred data. Also HTTP status codes like `404 Not Found`, `403 Forbidden` are logged here.

- `enginframe.[yyyy]-[mm]-[dd].log`

  Contains Tomcat®'s error logs about EnginFrame Portal not caught by EnginFrame itself.

The standard Tomcat® configuration fits the most common installations. In case of specific needs you can modify the default `$EF_TOP/<VERSION>/enginframe/conf/logging.properties` configuration. Refer to the official Tomcat® documentation fore more details.

EnginFrame server and agent logging

Topics

- Configuration files
- Apache® Log4j2 log configuration
- Change log file locations
- Change log file size and the rotation policy
- Change log level
- Fine tune logging

Configuration files

The default logging configurations are located under `$EF_TOP/<VERSION>/enginframe/conf`:

- `log.server.xconf`

  Contains server's configuration.

- `log.agent.xconf`

  Contains agent's configuration.

Both are XML files with the same syntax.

In case you need to modify the defaults, you can specify a new configuration in the `log.server.xconf` and `log.agent.xconf` files under the configuration directory `$EF_TOP/conf/enginframe`.

In these files you can configure the location where you store log files, their verbosity level, and rotation policies. By default, EnginFrame is configured to write only warning and error messages and to keep a history of 4 log files with a 10 MB maximum size.

The log's default location is under `$EF_TOP/logs/<HOSTNAME>` on server and agent hosts:

- `ef.log`

  Contains the server's logging. It also contains the local agent's logs. It is located on server's host.
- `agent.remote.stdout`

  Contains the agent's process standard output. It is located on the agent's host.
- `agent.remote.stderr`

  Contains the agent's process standard error. It is located on the agent's host.
- `agent.remote.log`

  Contains the agent's process logging. It is located on the agent's host.

If you need to quickly switch the log configuration to produce verbose logging, you can use `log.server.verbose.xconf` and `log.agent.verbose.xconf` files located in `$EF_TOP/<VERSION>/engifnrame/conf`.

You need to backup the previous `log.server.xconf` and `log.agent.xconf` files and replace them with the verbose configurations.

We don't recommend you use a verbose logging configuration when you're in a production environment. The performance impact of logging can be significant, depending on the logging threshold that is configured and especially if a large number of users are accessing the portal.

Apache® Log4j2 log configuration

EnginFrame is configured for Apache® Log4j2 logging as described in the following paragraphs.

EnginFrame server Log4j2 logging is configured in `${EF_TOP}/<VERSION>/enginframe/conf/log4j2.server.xml`. By default, logs are written to `${EF_LOGDIR}/ef.log`.

EnginFrame agent Log4j2 logging is configured in `${EF_TOP}/<VERSION>/enginframe/conf/log4j2.agent.xml`. By default. logs are written to `${EF_LOGDIR}/agent.remote.log`.

Log4j2 log configuration files apply to any EnginFrame internal dependency that uses Log4j2 logging, such as MyBatis or Quartz.

If you need to modify the defaults, you can specify a new configuration in the `log4j2.server.xml` and `log4j2.agent.xml` files under the configuration directory `$EF_TOP/conf/enginframe`.

Change log file locations

The EnginFrame logging system gives you complete flexibility on where to store log files. For example you may want to move log files from their default location to store them on a high speed file-system or to conform to your company's policies.

The location configuration is done in the `<targets>` section by setting the `<filename>` tag. The text inside this tag represents the path to the log file.

For example this XML text sets `${EF_LOGDIR}/ef.log` for the core components:

```
<targets>
  <enginframe id="core">
    <filename>${EF_LOGDIR}/ef.log</filename>
    ...
```

You can also decide whether to append or overwrite existing files by using the `<append>` tag.

In the following example the log file will be overwritten on every server restart:

```
<targets>
  <enginframe id="core">
    <filename>${EF_LOGDIR}/ef.log</filename>
    <append>false</append>
    ...
```

Change log file size and the rotation policy

Each EnginFrame Server and EnginFrame Agent is configured to write log files up to 10 MB and then to create another file to a maximum of 4 files. When a new log file is written the oldest one is deleted. This configuration guarantees that each server and agent uses no more than 40 MB of disk space for log files. You may want to change this rotation policy for example because you need more history. A change may also be helpful if you have increased log verbosity.

Changing the `<rotation>` tag inside the `<targets>` section configures the rotation policy. The `max` attribute defines the maximum number of files, while the `<size>` tag contains each file's size.

For example the following XML text defines a rotation of 5 files each one of 5 MB:

```
<rotation type="revolving" max="5">
  <size>5m</size>
</rotation>
```

Change log level

EnginFrame logging allows to have a fine grain control over which statements are printed. In a development environment, you might want to enable all logging statements while in a production environment it is suggested to disable debug messages to avoid performance issues. You can configure this behavior by setting the appropriate *log level*. A *log level* describes the urgency of a message. Below is a list of log levels that are usable within the EnginFrame logging system:

- `NONE`: No messages are emitted.
- `DEBUG`: Developer-oriented messages, usually used during development of the product.
- `INFO`: Useful information messages such as state changes, client connection, and user login.
- `WARN`: A problem or conflict has occurred but it may be recoverable, then again it could be the start of the system failing.
- `ERROR`: A problem has occurred but it is not fatal. The system still functions.
- `FATAL_ERROR`: Something caused whole system to fail. This indicates that an administrator should restart the system and try to fix the problem that caused the failure.

Each logger instance is associated with a log level. This allows you to limit each logger so that it only displays messages greater than a certain level. So if a DEBUG message occurred and the logger's log level was WARN, the message would be suppressed.

Changing the `log-level` attribute of a `<category>` tag sets log verbosity for the associated category.

For example, this XML tag defines a default category whose log-level is INFO:

```
<category name="" log-level="INFO">
  <log-target id-ref="core"/>
</category>
```

Fine tune logging

Define new categories and targets

In a complex system, it's often not enough to suppress logging based on log-level. For instance, you might want to log the network subsystem with DEBUG log-level while the simulator subsystem with WARN log-level. To accomplish this EnginFrame uses *categories*. Each `category` is a name, made up of name components separated by a "**.**". So a category named "network.interceptor.connected" is made up of three name components "network", "interceptor" and "connected", ordered from left to right. Every logger is associated with a category at creation. The left-most name component is the most generic category while the right-most name component is the most specific. So "network.interceptor.connected" is a child category of "network.interceptor", which is in turn a child category of "network". There is also a root category "" that is hidden. The main reason for structuring logging namespace in a hierarchical manner is to allow inheritance. A logger will inherit its parent log-level if it has not been explicitly set. This allows you to set the "network" logger to have INFO log-level and unless the "network.interceptor" has had its log-level set it will inherit the INFO log-level.

Categories send messages to log targets. Decoupling log message generation from handling allows developers to change destinations of log messages dynamically or via configuration files. Possible destinations include writing to a database, a file, an IRC channel, a syslog server, an instant messaging client, etc.

Adding a `<category>` tag inside the `<categories>` section defines a new category. You must specify its name and `log-target` to which log messages are written. The name of the category acts like a filter: all messages matching the category name are sent to the specified log-target.

For example, if you want more information from EnginFrame's download component you can use the category named `com.enginframe.server.download`:

```
<category name="com.enginframe.server.download" log-level="DEBUG">
```

```
  <log-target id-ref="core"/>
</category>
```

This configuration sends all download messages to the core target.

Another useful category is the `deadspooler`. The deadspooler category is used by EnginFrame to write messages concerning spoolers that could not be deleted and were renamed as DEAD. NICE support team recommends to turn this feature on. There is no overhead and it could be very useful to know why an EnginFrame spooler could not be deleted. This category is activated by setting its log-level to `INFO`:

```
<category name="deadspooler" log-level="INFO">
  <log-target id-ref="deadspooler"/>
</category>
```

Refer to *EnginFrame Administrator Reference* for a complete list of categories EnginFrame uses.

Change message format

Log targets that write to a serial or unstructured store (i.e., file-system or network based targets) need some method to serialize the log message before writing to the store. The most common way to serialize the log message is to use a `formatter`.

The format specified consists of a string containing raw text combined with pattern elements. Each pattern element has the generalized form:

```
%[+|-]#.#{field:subformat}
```

- `+|-` indicates whether the pattern element should be left or right justified (defaults to left justified if unspecified.)
- `#.#` indicates the minimum and maximum size of output, if unspecified the output is neither padded nor truncated.
- `field` indicates the field to be written and must be one of `category`, `context`, `user`, `message`, `time`, `rtime` (time relative to start of application), `throwable` or `priority`. This parameter is mandatory.
- `subformat` specifies which piece of field is interesting for log messages.

Use the `<format>` tag to set log message printing.

For example the following code shows format setting for the `core` target:

```
<enginframe id="core">
  <filename>${EF_LOGDIR}/ef.log</filename>
  <format type="enginframe">
    %7.7{priority} %5.5{rtime} [%8.8{category}]:%{message}\n%{throwable}
  </format>
  ...
```

A number of examples for format and actual output follows.

- Example

  Format:

  ```
  %7.7{priority} %5.5{rtime} [%8.8{category}]:%{message}\n%{throwable}
  ```

  Output:

  ```
  DEBUG   123   [network.]: This is a debug message
  ```

- Example

  Format:

  ```
  %7.7{priority} %5.5{rtime} [%{category}]:%{message}\n
  ```

  Output:

  ```
  DEBUG   123   [network.interceptor.connected]: This is a debug message
  DEBUG   123   [network]: This is another debug message
  ```

- Example

  Format:

  ```
  %7.7{priority} %5.5{rtime} [%10.{category}]:%{message}\n
  ```

  Output:

```
DEBUG   123   [network.interceptor.connected]: This is a debug message
DEBUG   123   [network   ]: This is another debug message
```

EnginFrame scriptlet logging

EnginFrame modularity lets developers add new features by deploying their plugins. If your plugin uses scriptlets, you have the same logging support on which EnginFrame is based. As an administrator you must know how to set up scriptlet logging for both development and production environments.

Creating `$EF_TOP/<VERSION>/enginframe/plugins/<myplugin>/conf/log.xconf` or `$EF_TOP/conf/plugins/<myplugin>/log.xconf` on EnginFrame Server's host enables scriptlet logging. This file has the same syntax as the ones shipped by EnginFrame under `$EF_TOP/<VERSION>/enginframe/conf`, so all the information in EnginFrame server and agent logging applies here too.

The scriptlet code can emit logging messages with any category and log level.

This is an example configuration file:

```
<?xml version="1.0"?>

<logkit>
  <factories>
    <factory
        type="enginframe"
        class="com.enginframe.common.utils.log.EnginFrameTargetFactory"/>
  </factories>

  <targets>
    <enginframe id="plugin">
      <filename>
        ${EF_LOGDIR}/myplugin.log
      </filename>
      <format type="enginframe">
        %7.7{priority} %5.5{rtime} [%{category}]:%{message}\n
      </format>
    </enginframe>
  </targets>
  <categories>
    <category name="myplugin" log-level="DEBUG">
      <log-target id-ref="plugin"/>
    </category>
    <category name="" log-level="WARN">
      <log-target id-ref="plugin"/>
    </category>
  </categories>
</logkit>
```

`${EF_LOGDIR}/<myplugin>.log` contains the log messages for this configuration. It exposes only two categories: `myplugin` and the `root` one (it is the one that has an empty name.) If your code uses `myplugin` category, then it logs `DEBUG` messages; if your code uses a category that is not defined, then it logs `WARN` messages.

If the plugin log.xconf configuration files don't exist, then EnginFrame defaults to the core `log.server.xconf` to define myplugin's logging categories.

EnginFrame licenses

This chapter describes how EnginFrame manages licenses, where license files are located, the meaning of license fields, how license tokens are counted, and how to check EnginFrame's license token usage. This information is relevant only when running EnginFrame on an on-premises or non-EC2 cloud-based server. EnginFrame is licensed for free on EC2. For more information about EnginFrame licensing, see Obtaining NICE EnginFrame.

License file management

EnginFrame loads its license files from `$EF_TOP/license`. All files ending with `.ef` extension are loaded.

If you want to replace an EnginFrame license while still retaining your previous license, rename your previous license by changing the `.ef` extension to something else (for example, add `.OLD` extension to the original file). If you don't make this change, EnginFrame loads the old license. Having two license for the same EnginFrame component leads to a conflict issue.

The EnginFrame license management system reads licenses dynamically from the file-system, and can detect any changes you apply to licenses even to recognize if the license files were added or removed.

Configuring license files location

`$EF_TOP/license` is the default directory where EnginFrame loads licenses from. This directory can be changed making EnginFrame load licenses from another location in your file-system.

You can modify `EF_LICENSE_PATH` parameter inside `$EF_TOP/conf/enginframe/server.conf`, and then define an absolute file-system path. This changes the directory EnginFrame uses to load licenses.

Example: `EF_LICENSE_PATH=/mnt/server/ef-licenses`

License file format

An EnginFrame license is an XML file that describes one or more EnginFrame licensed components or plugins. The main component of EnginFrame is `EF Base`. It activates the core functions of EnginFrame.

The license fields are the following:

- `product`: This field describes the item that's being licensed (for example, `EnginFrame PRO`)
- `release`: A major release of EnginFrame (for example, 2021.0)
- `format`: The license file format number (for example, 2.0)
- `component`: The component that's being licensed. Example components include `EF Base` and `webservices`.
- `expiration`: The license expiration date. The value `never` indicates a perpetual license.
- `ip`: The licensed IP addresses where EnginFrame can be deployed. It can be a single host IP address, a range of IP addresses, or a list of IP addresses. The license is valid if EnginFrame is running on one of the mentioned hosts IP addresses.
- `type`: The type of license. Valid values are `DEMO`, `YEAR`, and `FULL`.
- `units`: The number of license tokens.
- `units-per-user`: The number of tokens that EnginFrame locks for each concurrent user.
- `license-hosts`: If this value is set to `truey`, EnginFrame locks a token for each host in the underlying grid infrastructure.

- `hosts-preemption`: If this value is set to `true`, EnginFrame releases tokens that are received by hosts for new users that are accessing the system. This happens when all tokens have been used.
- `signature`: The license signature that accounts for all the license fields values.

The following is an example EnginFrame license.

```
<?xml version="1.0"?>
<ef-licenses>
  <ef-license-group product="EnginFrame PRO" release="2017.0" format="2.0">
    <ef-license
      component="EF Base"
      vendor="NICE"
      expiration="2017-08-15"
      ip="80.20.156.116"
      licensee="RnD Team"
      type="DEMO"
      units="20"
      units-per-user="1"
      license-hosts="true"
      hosts-preemption="true"
      signature="..." <!-- Omitted for space -->
    />
  </ef-license-group>
</ef-licenses>
```

License checking

The most important license fields are `component`, `ip`, `expiration`, and `units`. You can statically verify the first three fields. These field values depend on your EnginFrame deployment setup:

- In the following example of a valid license file format, `component="EF Base"` unlocks the EnginFrame core. This component is required to unlock other components, such as `webservices`, that can be enabled with a dedicated section in the licence file.

  ```
  <ef-licenses>
    <ef-license-group product="EnginFrame HPC PRO" release="2021" format="2.0">
      <ef-license
        component="EF Base"
  ```

```
      vendor="NICE"
      expiration="2023-03-31"
      ip="*"
      licensee="nice-enginframe-dev"
      type="DEMO"
      units="30"
      units-per-user="1"
      license-hosts="false"
      hosts-preemption="false"
      signature="------"
    />
    <ef-license
      component="webservices"
      vendor="NICE"
      expiration="2023-03-31"
      ip="*"
      licensee="nice-enginframe-dev"
      type="DEMO"
      units="30"
      signature="------"
    />
...
  </-license-group>
</ef-licenses>
```

Send questions to `<helpdesk@nice-software.com>` for your requirements and to get help on understanding which components you actually need to satisfy your goals.

- The *IP address* depends on EnginFrame's host.

EnginFrame Server's Host IP Address

You must determine EnginFrame Server's host IP address for a valid license.
To verify which IP address is correct for the license request, run the `ping `hostname`` command. This returns the hostname and the IP address information.
EnginFrame doesn't allow for loopback IP address, such as `127.0.0.1`. If you run a **ping** command and it returns a loopback address, you need to configure the host name resolution for EnginFrame Server. You can configure it either by editing `/etc/hosts` or by changing the DNS, NIS, or LDAP configurations.

- *Expiration date* states how long your license is valid. Evaluation licenses last one month. However, NICE can release licenses with an validity period that meets your evaluation needs. You can send a request form on the website where you download EnginFrame or send an email to `<helpdesk@nice-software.com>`.

- The *units* field expresses the total number of license tokens.

License token count

Different scenarios have to be considered when EnginFrame counts license tokens. The scenarios change according to different combinations of some license fields.

License tokens are dynamically used by EnginFrame on the base of system usage and load, such as the number of concurrent users or the number of hosts in the grid environment accessed through EnginFrame. When EnginFrame consumes a token, it subtracts it from the total number of available tokens expressed by the `units` license field.

Tokens that are acquired by a user are always released after the user logs out of the system or on his working session expires. When a user logs out or when a session expires, the user's tokens are released. Tokens acquired by hosts are released only on pre-emption (if expressed in the license, for the needed amount) or when EnginFrame is restarted (all tokens are released).

The following scenarios depict how EnginFrame acquires and releases license tokens:

1.
   ```
   license-hosts="true"
   hosts-preemption="true"
   ```

   EnginFrame acquires one token for each concurrent user accessing the system and one token for each host in the underlying computing environment.

   Because pre-emption on hosts tokens is switched on, when all the tokens are used, additional users logging into system are granted access by reclaiming one token from those acquired by hosts. The host whose token has been reclaimed is now unlicensed.

   If all tokens are used and there are no more tokens to preempt, system access is denied.

   Available tokens are dynamically acquired by users or hosts.

   EnginFrame doesn't show unlicensed hosts details, such as the kind of host, status, and memory consumption.

2.
   ```
   license-hosts="true"
   ```

```
hosts-preemption="false"
```

As in the previous scenario, EnginFrame acquires one token for each concurrent user accessing the system and one token for each host in the underlying computing environment.

Differently from the previous scenario, tokens that are used by hosts are never released. Only restarting EnginFrame resets host's license token status.

When all the tokens are used, the system denies further accesses.

Available tokens are dynamically acquired by users or hosts.

Unlicensed hosts are managed as in the previous scenario.

3.
```
license-hosts="false"
units-per-user="<n>"
```

In this scenario, EnginFrame acquires `n` tokens for each concurrent user where `n` is a positive integer. No tokens are acquired by hosts meaning they are all licensed.

This kind of license fits all those cases where you deal with big or growing clusters and it is more convenient to have a flat license for the number of hosts.

When all the tokens are used by users, the system denies further accesses. If this happens, no token reclaim occurs because host can't acquire new tokens.

List of licensed hosts

An optional list of licensed hosts for the previous scenarios can be created. This list spares license tokens though limiting cluster view through EnginFrame.

Create `license.hostlist` in `EF_LICENSE_PATH` to declare the list of licensed hosts. The file must contain the host names, listed one per line. The host names must be reported in the same way that they are reported by the job scheduler.

This following is a `$EF_TOP/license/license.hostlist` example.

```
host-linux1.nice
host-linux2.nice
host-linux3.nice
host-unix1.nice
```

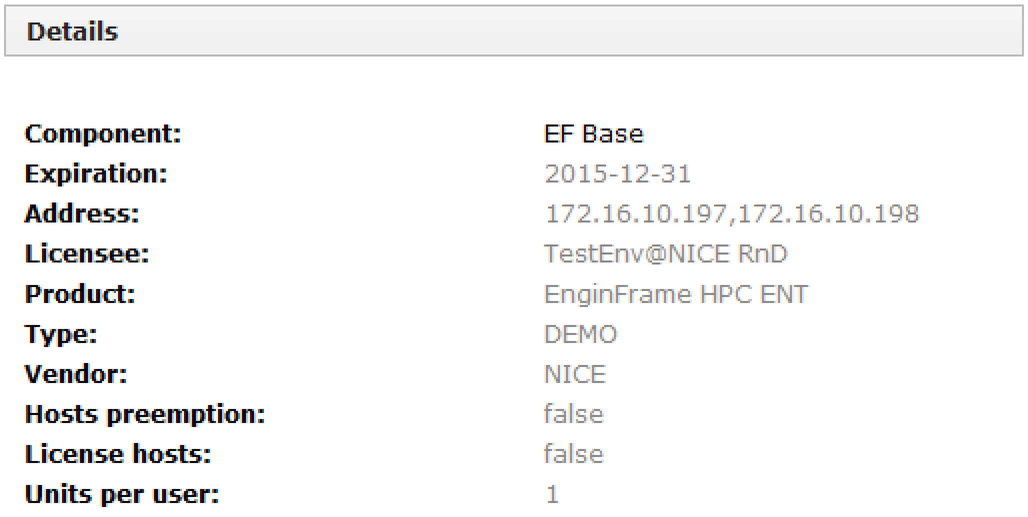
```
host-win1.nice
host-win2.nice
```

Monitoring license usage

License token consumption is an important aspect for an EnginFrame administrator.

The EnginFrame Operational Dashboard provides administrators with an overview of installed licenses and provide details for used license tokens. Loaded licenses with their field values are shown as follows.

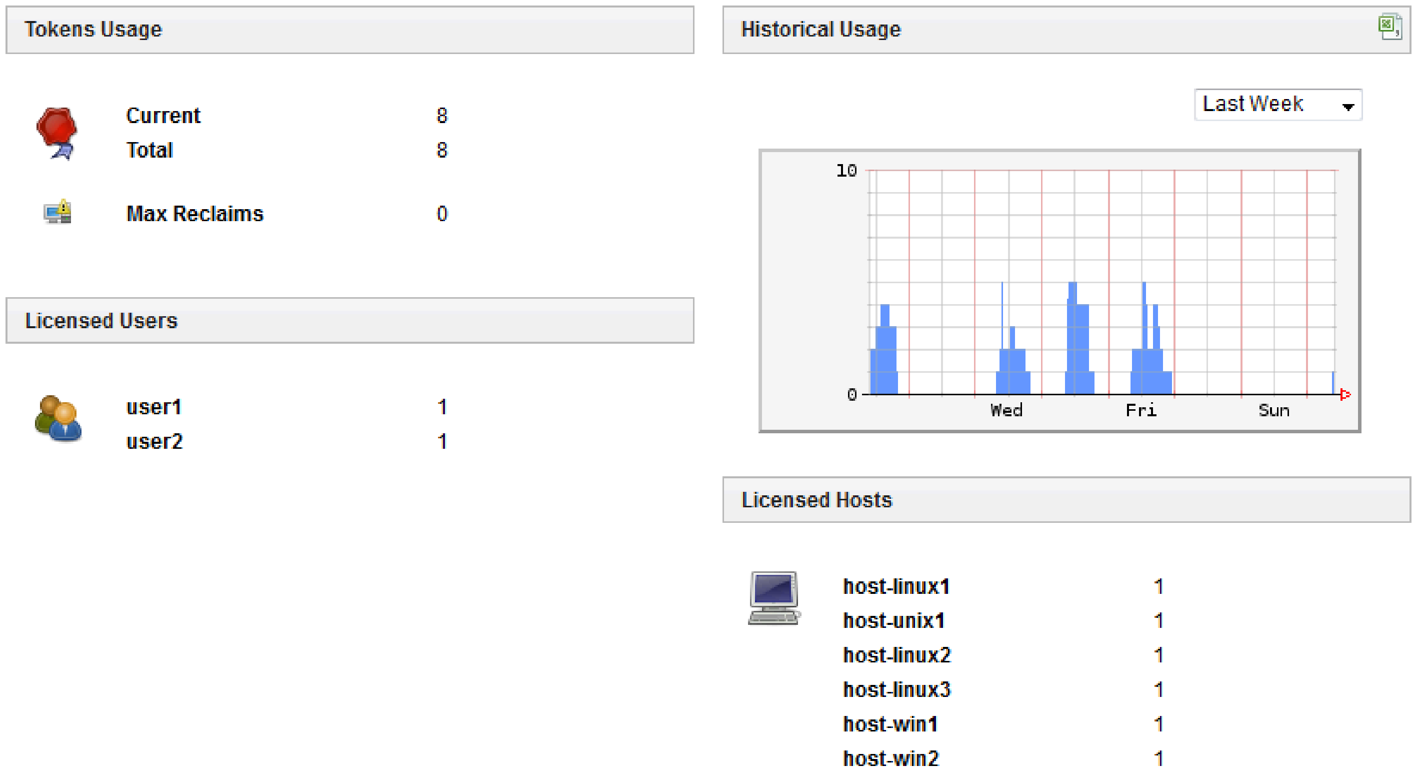
EnginFrame License Details


Details

Component:	EF Base
Expiration:	2015-12-31
Address:	172.16.10.197,172.16.10.198
Licensee:	TestEnv@NICE RnD
Product:	EnginFrame HPC ENT
Type:	DEMO
Vendor:	NICE
Hosts preemption:	false
License hosts:	false
Units per user:	1

The license token usage details are also provided.

EnginFrame License Tokens Status



Tokens Usage

Current	8
Total	8
Max Reclaims	0

Historical Usage

Last Week

Licensed Users

user1	1
user2	1

Licensed Hosts

host-linux1	1
host-unix1	1
host-linux2	1
host-linux3	1
host-win1	1
host-win2	1

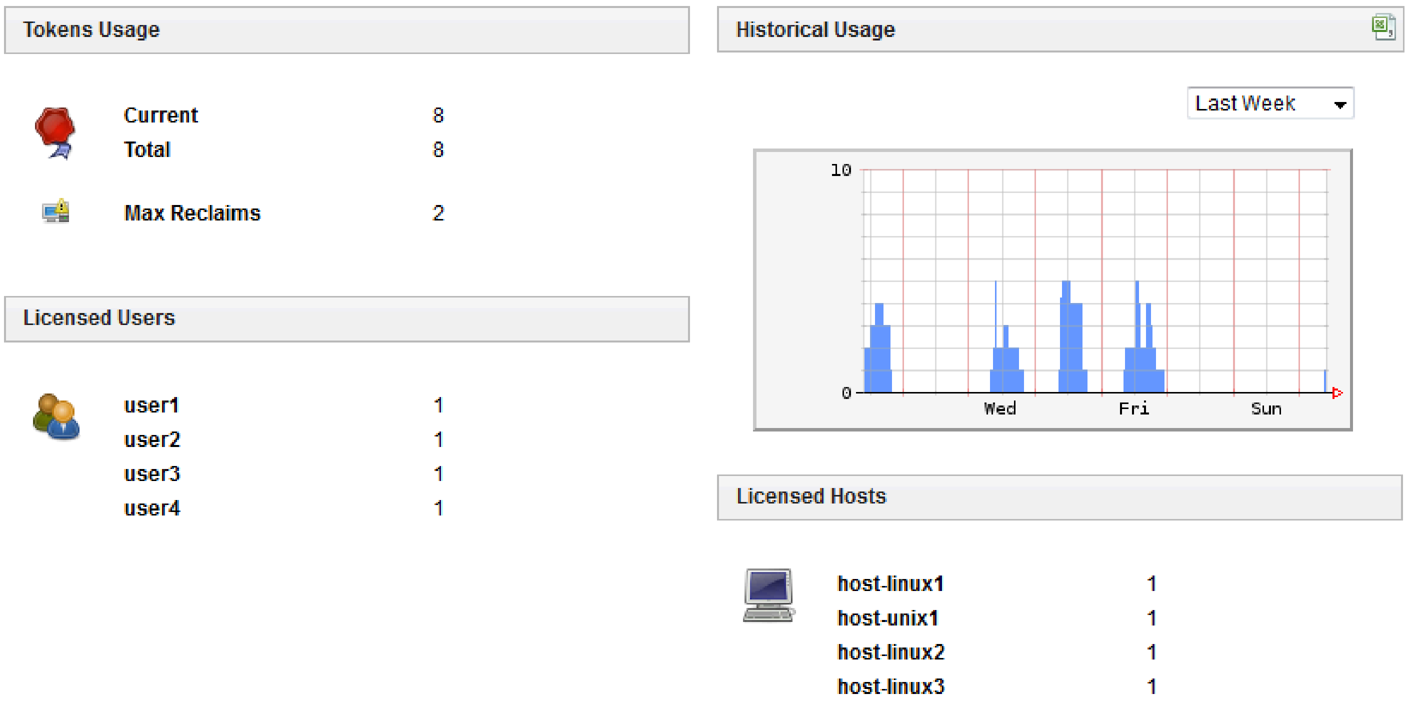
You can monitor the total number of used tokens, which users have logged in, and which hosts are currently licensed. In the preceding example, EnginFrame acquired a license token for all reported users and hosts.

Note

If the same user name connects from two different workstations or browsers at the same time, an extra token is used as a result. Tokens aren't acquired nominally but on a concurrent user basis only.

You can also check if there were any token reclaims in the system previously. The value reported is the maximum number of reclaimed tokens that occurred since EnginFrame's last restart.

EnginFrame License Tokens Status With Reclaims



Tokens Usage

Current	8
Total	8
Max Reclaims	2

Licensed Users

user1	1
user2	1
user3	1
user4	1

Historical Usage

Licensed Hosts

host-linux1	1
host-unix1	1
host-linux2	1
host-linux3	1

In the preceding screenshot, there are two token reclaims. In all, there are eight tokens. All eight tokens were used by six hosts and two users. The next two requests from `paolo` and `aware` were satisfied but required two token reclaims from the hosts.

Enable debug log messages for licenses

If you're experiencing problems with the EnginFrame license system, require support from the NICE Support Team, or want to check license management details, it is important to enable the license management module's debug log level.

You can enable the license module's debug log level by adding a category to the `log.server.xconf` file as shown in the following snippet.

```
<category name="com.enginframe.common.license" log-level="DEBUG">
  <log-target id-ref="core"/>
</category>
```

Alternatively, use `log.server.verbose.xconf`. It already has the log level set to DEBUG.

For more information, see Customizing logging.

Troubleshooting

Common issues

This section lists some common issues and the steps to resolve them:

Topics

Breaking change in AJP Connector configuration from EnginFrame 2019.0-1424

When updating to 2019.0-1424 or later from a previous version, if AJP Connector is enabled, EnginFrame might fail to start after a successful upgrade. This is because of a breaking change in Tomcat starting from version 7.0.100. From Tomcat CHANGELOG:

Rename the requiredSecret attribute of the AJP/1.3 Connector to secret and add a new attribute secretRequired that defaults to true. When secretRequired is true the AJP/1.3 Connector will not start unless the secret attribute is configured to a non-null, non-zero length String.

By default, Tomcat expects `secret` to be configured. If you set a `requiredSecret`, it's no longer picked up because of the attribute name change. To confirm an EnginFrame installation is impacted by this issue, check the `${EF_LOGDIR}/tomcat/catalina.*.log` files for the presence of the following message:

The AJP Connector is configured with secretRequired="true" but the secret attribute is either null or "". This combination is not valid.

Resolve the issue in the *${EF_CONF_ROOT}/tomcat/conf/server.xml* file, in the AJP Connector block. Make one of the following changes and then restart:

- If you have a non empty *requiredSecret*, rename it to *secret*
- Otherwise, add the parameter *secretRequired="false"*

Interactive service imports using Slurm before and after EnginFrame version 2020.1-r413

After the release of EnginFrame version 2020.1-r413, you can no longer import interactive services using Slurm as a grid manager with EnginFrame versions that are earlier than 2020.1-r413. To resolve this issue, you must create a new interactive service instead of importing one using Slurm.

In addition, after 2020.1-r413, the default interactive services "Linux Desktop" and "Windows desktop" don't work as-is when using Slurm as a scheduler. To make them work, open them in edit mode at least one time.

Updating to EnginFrame version 2021.0-r1646 or later

Because Hazelcast is updated by 2 major versions with EnginFrame version 2021.0-r1646, you must take additional steps before you update EnginFrame to this and later versions.

If you have an EnginFrame Enterprise setup, you must first stop the EnginFrame service in all of the instances to perform a successful update to EnginFrame versions 2021.0-r1646 or later.

Moreover, if you have a custom `hazelcast.xml` configuration (modified from the default configuration), you must do the following before updating to EnginFrame versions 2021.0-r1646 or later:

- Port the custom `hazelcast.xml` to the format used by Hazelcast 5 following the relevant Hazelcast documentation.
- Copy it over to the `$EF_ROOT/conf folder`, overwriting the default `hazelcast.xml` file.

Updating to EnginFrame version 2021.0-r1653 or later

When performing an update to this version from a previous installation of EnginFrame, you must make sure that the `server.xml` file in the `tomcat` folder `/opt/nice/enginframe/conf/tomcat/conf/server.xml` has this line removed since it breaks Tomcat 9:

```
<Listener className="org.apache.catalina.core.JasperListener"/>
```

If Tomcat is configured to use HTTPS, make sure you remove the `protocol` parameter from the `Connector` section in the `server.xml` config file:

```
<Connector port="{$httpsd_port}" protocol="org.apache.coyote.http11.Http11Protocol"
```

```
maxThreads="150" SSLEnabled="true" scheme="https" secure="true"
clientAuth="true" sslProtocol="TLS"
```

should be:

```
<Connector port="{$httpsd_port}"
maxThreads="150" SSLEnabled="true" scheme="https" secure="true"
clientAuth="true" sslProtocol="TLS"
```

Updating Log4j library in EnginFrame

Due to an issue in the Apache Log4j library (CVE: https://www.randori.com/blog/cve-2021-44228) included in EnginFrame from version 2019.0-r1424 to 2021.0-r1307, NICE recommends that you upgrade to the latest EnginFrame version available on https://download.enginframe.com or update the Log4j library in your EnginFrame installation as described in the following instructions:

1. Identify the EF_TOP and EF_ROOT folder of your EnginFrame installation. For more information, see Installation directories.
2. Identify the log4j files:

```
$ find "$EF_TOP" -name log4j*.jar
<EF_ROOT>/agent/log4j-
core-<OLD_VERSION>.jar
<EF_ROOT>/agent/log4j-
api-<OLD_VERSION>.jar
<EF_ROOT>/agent/log4j-1.2-
api-<OLD_VERSION>.jar
<EF_ROOT>/WEBAPP/WEB-INF/lib/log4j-
core-<OLD_VERSION>.jar
<EF_ROOT>/WEBAPP/WEB-INF/lib/log4j-
api-<OLD_VERSION>.jar
<EF_ROOT>/WEBAPP/WEB-INF/lib/log4j-1.2-api-<OLD_VERSION>.jar
```

   Items highlighted in *red* represent your values.
3. Stop EnginFrame. For more information, see Running NICE EnginFrame:

```
$  EF_TOP/bin/enginframe stop
```

4. Backup the old log4j files to a backup directory of your choice:

```
$ EF_ROOT=...
BACKUP_AGENT_DIR=/tmp/backup/agent
BACKUP_SERVER_DIR=/tmp/backup/server
mkdir -p $BACKUP_AGENT_DIR
mkdir -p $BACKUP_SERVER_DIR
mv $EF_ROOT/agent/log4j-core-<OLD_VERSION>.jar $BACKUP_AGENT_DIR
mv $EF_ROOT/agent/log4j-api-<OLD_VERSION>.jar $BACKUP_AGENT_DIR
mv $EF_ROOT/agent/log4j-1.2-api-<OLD_VERSION>.jar $BACKUP_AGENT_DIR
mv $EF_ROOT/WEBAPP/WEB-INF/lib/log4j-core-<OLD_VERSION>.jar $BACKUP_SERVER_DIR
mv $EF_ROOT/WEBAPP/WEB-INF/lib/log4j-api-<OLD_VERSION>.jar $BACKUP_SERVER_DIR
mv $EF_ROOT/WEBAPP/WEB-INF/lib/log4j-1.2-api-<OLD_VERSION>.jar $BACKUP_SERVER_DIR
```

5. Download and expand the Log4j `tar.gz` you want to update to from https://logging.apache.org/log4j/2.x/download.html. It's essential that you verify the integrity of the downloaded files using the PGP and SHA512 signatures, as suggested by the download page of Apache Log4j.

6. Copy the following jar files from the downloaded package to the EnginFrame folder:

```
$ DOWNLOADED=apache-log4j-<NEW_VERSION>.0-bin
cp $DOWNLOADED/log4j-core-<NEW_VERSION>.jar $EF_ROOT/agent/
cp $DOWNLOADED/log4j-api-<NEW_VERSION>.jar $EF_ROOT/agent/
cp $DOWNLOADED/log4j-1.2-api-<NEW_VERSION>.jar $EF_ROOT/agent/
cp $DOWNLOADED/log4j-core-<NEW_VERSION>.jar $EF_ROOT/WEBAPP/WEB-INF/lib/
cp $DOWNLOADED/log4j-api-<NEW_VERSION>.jar $EF_ROOT/WEBAPP/WEB-INF/lib/
cp $DOWNLOADED/log4j-1.2-api-<NEW_VERSION>.jar $EF_ROOT/WEBAPP/WEB-INF/lib/
```

7. Start EnginFrame. For more information, see Running NICE EnginFrame:

```
$ EF_TOP/bin/enginframe start
```

Pushing metrics to external monitoring tools

EnginFrame can push its metrics to external monitoring tools through StatsD. StatsD is a network daemon that runs on the Node.js platform and listens for statistics that are provided by tools such as counters and timers. StatsD sends aggregates to one or more pluggable backend services, such as Amazon™ CloudWatch.

Supported monitoring tools

We support every monitoring tool that implements the StatsD backend service to forward metrics. For more information about available StatsD backend services, see Supported Backends in the *StatsD README* on the GitHub website.

Prerequisites

The following are required to configure EnginFrame to use StatsD to push metrics to an external monitoring tool.

- A monitoring tool that StatsD supports.
- A running StatsD instance that's configured to forward metrics to the monitoring tools in use. StatsD must be configured to use User Datagram Protocol (UDP). This is the default option. For more information about configuring StatsD, see Installation and Configuration in the *StatsD README* on the GitHub website.

Configuration

To configure EnginFrame to push metrics to a StatsD instance, you must configure the `STATSD_ADDR` and `STATSD_PORT` variables. These are located in the following configuration file: `$EF_ROOT/plugins/admin/conf/admin.statistics.efconf`.

In the following example configuration, StatsD is run locally on port 8125.

```
################################################################################
# StatsD Server Configuration
################################################################################

STATSD_ADDR=localhost
STATSD_PORT=8125
```

Troubleshooting

EnginFrame provides the `$EF_LOGDIR/admin.log` log file. You can use it to troubleshoot and diagnose errors.

Security

Topics

Authentication framework

The EnginFrame authentication framework supports a variety of different authentication methods. You can easily write your own custom mechanism to authenticate users when standard methods don't meet your specific requirements.

Standard EnginFrame authentication authorities

When you install EnginFrame, the following built-in authentication mechanisms are available:

- Pluggable authentication modules (PAM)
- Lightweight Delivery Access Protocol (LDAP)
- HTTP authentication
- Active Directory (AD) authentication
- Certificate-based authentication

Default authentication authority

When you install EnginFrame, you choose what authentication method you want to be the default authentication method that's used to access services. You can change this setting later on. To change it, change the `EF_DEFAULT_AUTHORITY` property setting in the `server.conf` config file. For example, to set the default authentication method to PAM, change the relevant line to the following: `EF_DEFAULT_AUTHORITY=pam`.

The default authentication method that you set when you installed EnginFrame is used by all the services that have the `ef:agent`'s *authority* attribute set to `${EF_DEFAULT_AUTHORITY}`. This is shown in the following example.

```
<ef:agent xmlns:ef="http://www.enginframe.com/2000/EnginFrame"
  id="tutorial"
  authority="${EF_DEFAULT_AUTHORITY}">
```

You can set the authentication authority at the `ef:service` level to override the default authentication method that you chose when you installed EnginFrame. The default authentication authority that you chose is defined in the root `ef:agent` tag.

User mapping

Users can log in to the EnginFrame portal with a username that's different from that of their account in the underlying computing environment, when you configure EnginFrame *user mapping*. User mapping works by mapping usernames provided at login time to usernames in the underlying operating system.

For example, the user *John Smith* can log into the EnginFrame Portal using by entering `John Smith` and submit a job that's run as the user `jsmith` on the underlying Unix computing environment.

In some cases, user mapping can also be used to map different users of the portal to the same system account, or to map the same user to different accounts on separate systems.

Mapping `root` Account

You can't map users to the `root` account.

All of the authentication modules that are built-in and available when you install EnginFrame support user mapping.

To enable user mapping, complete the following steps:

1. In the `$EF_TOP/conf/plugins/<authority>/ef.auth.conf` config file, set the `EFAUTH_USERMAPPING` parameter to `true`.
2. In the `EF_ROOT/plugins/<authority>/bin` directory of the authentication module, add a script that's named `ef.user.mapping`.
3. Set the ownership of the `ef.user.mapping` file to `root:root` and its permissions to `755` (`rwxr-xr-x`).

The `ef.user.mapping` script must output the mapped username for the user that's being authenticated.

In the following example, `ef.user.mapping` maps all the portal users to the unique `jsmith` user.

```
#!/bin/sh

echo “jsmith”
```

In the following example, user mapping involves reading a file where each line specifies a mapping using the `Login Name=username` format.

For example, a file that's named `EF_ROOT/plugins/<authority>/conf/user.mapping` contains the following.

```
# simple mapping file
#
# Syntax: loginname=unixaccount
#

Lucy Johnson=ljohnson
John Smith=jsmith
```

In this example, the `ef.user.mapping` script attempts to match the name that's provided by the user during login with the ones that are present on the left-hand side of the equal sign in the `user.mapping` file. Then, as shown in the following output, it maps it to the corresponding account name on the right-hand side of the equal sign.

```
#!/bin/sh

# read login name from command line
_loginname="$1"

# mapping file
_mappingfile=`dirname "$0"`"/../conf/user.mapping"

# transform login name so it can be used by sed in a safe way
_happysed=`echo "${_loginname}" | sed \
  -e 's#\\\\#\\\\\\\\#g' \
  -e 's#/#\\\/#g' \
  -e 's/\\./\\\\./g' \
  -e 's/\\[/\\\\[/g'
`
# extract mapped unix account
_mapping=`sed -n 's/^'"${_happysed}"'=\(.*\)$/\1/p' "${_mappingfile}"`

# check with case insensitive flag if necessary
if [ -z "${_mapping}" ] ; then
  _mapping=`sed -n 's/^'"${_happysed}"'=\(.*\)$/\1/pi' "${_mappingfile}"`
fi

# print first result
if [ -n "${_mapping}" ] ; then
  echo "${_mapping}" | sed 'q'
else
  exit 1
fi
```

With user mapping, an administrator can log in as an emulated user that's experiencing issues in a running production environment for testing purposes. This can be accomplished without compromising other accounts. With the following simple example `ef.user.mapping` file, a user named `user1` takes on the identity of `user2` without impacting other user accounts.

```
#!/bin/bash
if [["$1"==user1]] ; then
  echo "user2"
else
  echo "$1"
fi
```

Configuring the NICE EnginFrame authentication authorities

Besides the user mapping feature that's described in the previous section, the authentication authorities that are provided when you install EnginFrame have additional configuration parameters that can be changed to tailor the authentication process to your environment.

Topics

- PAM authentication
- LDAP authentication
- Active Directory authentication

- Using signed certificates with EnginFrame
- Certificate authentication

PAM authentication

The pluggable authentication modules (PAM) authority authenticates a user using the PAM method of the Operating System.

The `PAM_SERVICE` parameter in the `$EF_TOP/conf/plugins/pam/ef.auth.conf` file on your Agent host specifies which PAM service is used for the authentication.

LDAP authentication

This authority authenticates users querying a LDAP database. You can configure the settings in the `$EF_TOP/conf/plugins/ldap/ef.auth.conf` config file on your Agent host. You can specify the location of the LDAP server to use and customize database access.

The following parameters are available:

- `LDAP_LDAPSEARCH`: the absolute path to the **ldapsearch** executable
- `LDAP_SERVER`: LDAP Server name or IP address
- `LDAP_PORT`: LDAP Server port
- `LDAP_BASE`: the base DN (Distinguished Name) that's used for the search operation in the LDAP database

Active Directory authentication

This authentication authority authenticates users querying an Active Directory database. You can configure the settings in the `$EF_TOP/conf/plugins/activedirectory/ef.auth.conf` config file on your Agent host. You can specify the location of the Active Directory server to use and customize database access.

The following parameters are available:

- `AD_LDAPSEARCH`: the absolute path to the **ldapsearch** executable
- `AD_SERVER`: LDAP Server name or IP address
- `AD_PORT`: LDAP Server port

- `AD_BASE`: the base DN (Distinguished Name) for the search operation in the Active Directory database
- `AD_BINDAS`: the user that has permissions to bind to an Active Directory Server for queries
- `AD_BINDPWD`: the password for a user binding to an Active Directory Server

Using signed certificates with EnginFrame

HTTP authentication is different from the other EnginFrame authentication methods: HTTP authentication is accomplished by the Web Server.

After the user is authenticated by the Web Server, the EnginFrame HTTP authentication authority allows you to perform some initialization steps. Specifically, it allows you to use the EnginFrame user mapping feature that was mentioned in the User mapping section. You can use this feature to map the EnginFrame Portal users to the underlying operating system usernames.

Tip

When using HTTP authentication, in the case that you need to configure a user mapping that retrieves information from an LDAP Server, we recommend that you use the `openldap` software.

Certificate authentication

The certificate authority (CA) relies on X.509 certificates to encrypt the channel, check the client's identity, and authenticate users.

The EnginFrame web server must be configured to use X.509 certificates for HTTPS channel encryption and client authentication. EnginFrame uses a certificate authority to authenticate a user. You can configure either the Apache Tomcat® web server provided with EnginFrame, or an external web server such as Apache® Web Server connected to NICE EnginFrame Tomcat® with AJP connector to use certificates. For more information, see Configuring HTTPS.

For a client to authenticate to EnginFrame, the client must provide a valid certificate the web server recognizes and trusts, and a username to be used by EnginFrame to log in with.

EnginFrame can be configured to retrieve the username from the first Common Name (CN) field of the Distinguished Name (DN) certificate property or from the HTTP request parameter named `_username`.

`authorization.certificate.userCertificate` is that parameter that's used to configure where EnginFrame looks for the client username. It's in the `server.conf` config file. If this parameter is set `true`, the username is retrieved from the CN field of the DN in the client certificate. If this parameter is set to `false`, the username is retrieved from the client HTTP authentication request.

With the Certificate authority, like other authentication authorities, it's possible to use the user mapping feature that was mentioned in the User mapping section. This allows EnginFrame Portalusers to be mapped to underlying operating system usernames.

Custom authentication authority

If none of the standard mechanisms included in EnginFrame meet your specific requirements, you can create your own authentication algorithm.

The process of writing a custom EnginFrame authentication module involves the development of the following components:

- The `EF_ROOT/plugins/`*`<authority>`*`/etc/`*`<authority>`*`.login` file. This file is used to specify the fields the users enter for authentication. Afterwards, the field values are passed to the following authentication module at login time.
- The `EF_ROOT/plugins/`*`<authority>`*`/bin/ef.auth` authentication module script. It receives the authentication field values that the user entered as input and completes the authentication.

After the new authority is ready, it can be used in the `authority` attribute for `ef:agent` and `ef:service` tags in the service definition file (SDF).

Warning

If one of the authentication authorities that's included in EnginFrame doesn't quite meet your specific requirements, *do not modify EnginFrame system files*. Rather, create your own authority. You can use the authentication authorities that are provided with EnginFrame as a starting point.
It's important to note that modifying one or more of the EnginFrame system files might corrupt the system. We strongly recommend that you do not modify EnginFrame system files. Only modify EnginFrame system files at your own risk. NICE and its partners do not respond for EnginFrame unresponsiveness if a system file has been modified. Understand also that a future EnginFrame update might override your modifications without warning.

The *<authority>*.login file

This XML file defines the authentication parameters that are required by the authentication script to check user credentials.

This file specifies the information (including the username, token, and password) and prompts for the logon pages that are associated with the authentication module.

The login file must match the authority name, that is, the name that will be used in the EnginFrame SDF. It must also be located under the `EF_ROOT/plugins/`*`<authority>`*`/etc` directory. For security reasons, the file ownership must be set to `root:root` and its permissions must be 644 (`rw-r--r--`).

For example, the login file for authority *PAM* must be: `EF_ROOT/plugins/pam/etc/pam.login`

The *`<authority>`*`.login` file has the following structure:

```
<ef:login title="login_form_title"
          xmlns:ef="http://www.enginframe.com/2000/EnginFrame">;
  <ef:signature label="login_field_label"
                type="text|password"
                id="authentication_parameter_name" />;
  <!-- [<ef:signature ... />] -->
</ef:login>
```

The following example is taken from the *PAM* authority:

```
<ef:login title="Login to EnginFrame">
  <ef:signature label="Username: "
                type="text"
                id="_username"/>
  <ef:signature label="Password: "
                type="password"
                id="_password"/>
</ef:login>
```

The `ef:login` entry corresponds to an authentication HTML page. Referring to the example, the HTML logon page asks users to enter a text token (the username) and a password.

Note

We strongly recommend that you use the authentication parameters `<ef:signature>` with `id=_username` and `id=_password` (the `<ef:signature>` tags of the `pam.login` example). Otherwise, you must include `<ef:user-mapping>` in the `<authority>.login` file to provide the outputs that EnginFrame needs retrieve the username.

For more information about the XML format that's used by the *`<authority>`*`.login` file, see EnginFrame Administrator Reference.

The `ef.auth` File

The script `ef.auth` actually implements the authentication procedure.

It must reside under the directory `EF_ROOT/plugins/`*`<authority>`*`/bin`. The *<authority>* must match the authority name that will be used in the EnginFrame SDF. For security reasons, the file ownership must be set to `root:root` and its permissions must be set to `755` (`rwxr-xr-x`).

For example, the authentication script for the LDAP authority is `EF_ROOT/plugins/ldap/bin/ef.auth`.

The authentication script receives as input the login form parameters values that the user entered. Such values, separated by '`\0`' character (ASCII code `0`), are directly passed to the `ef.auth` script in the same order that they're defined in the `<authority>.login` file.

Consider the *PAM* authentication authority as an example. When a user that's named `demo` with a password `secret` logs into EnginFrame, the string `demo\0secret\0` is passed to the `ef.auth` script.

The authentication script checks the credentials passed as input and writes the response to the standard output. If the credential check was successful, the response is as follows:

```
<?xml version="1.0"?>
<ef:auth xmlns:ef="http://www.enginframe.com/2000/EnginFrame">

  <ef:result>
    <ef:grant />
  </ef:result>

</ef:auth>
```

If it isn't successful, the response is as follows:

```
<?xml version="1.0"?>
<ef:auth xmlns:ef="http://www.enginframe.com/2000/EnginFrame">

  <ef:result>
    <ef:deny />
  </ef:result>

  <ef:error> <!-- Not mandatory -->
    <ef:message>error_message</ef:message>
  </ef:error>

</ef:auth>
```

If the credential check was successful and you have configured user mapping for your custom authentication authority, the `ef:user-mapping` tag is included in the `ef.auth` script output:

```
<?xml version="1.0"?>
<ef:auth xmlns:ef="http://www.enginframe.com/2000/EnginFrame">

  <ef:result>
    <ef:grant />
    <ef:user-mapping name="target_username"
  </ef:result>

</ef:auth>
```

`target_username` is the username that's used on the underlying operating system.

We recommend that you move the user mapping logic to a separate script that can be changed without editing `ef.auth` itself. The authentication modules that are built into EnginFrame follow the convention of using the `EF_ROOT/plugins/`*`<authority>`*`/bin/ef.user.mapping` script. For more information, see User mapping.

If you move the user mapping logic to a separate script, your `ef.auth` script has the following structure:

```
[Get credentials]

[Verify credentials]
```

```
[If User is authenticated]
   ACTUAL_USERID=[Custom User Mapping procedure]

   [Emit]
       <?xml version="1.0"?>
       <ef:auth xmlns:ef="http://www.enginframe.com/2000/EnginFrame">
         <ef:grant/>
         <ef:user-mapping name="$ACTUAL_USERID"/>
       </ef:auth>
   [end]
[end]
```

Authorization system

You can use the EnginFrame Authorization System to control which *users* can access the EnginFrame *resources* based on policies that you set. Through these policies, you can grant or deny a user access to specific resources or to do specific operations.

In the EnginFrame Authorization System, *users* and *groups* are called Actors, *resources* are divided into EnginFrame service definition files (SDF) folders, services, service options, service actions and service output, and the *policies* define the permissions that are specified using access control lists (ACL).

The authorization framework defines *who* can do *what* on *which resources*. By configuring the authorization system, you can give different views of the EnginFrame Portal to different users and user groups.

Configuring authorization

EnginFrame authorization settings are specified in the following configuration files. The ACLs and Actors that are defined in all of them are merged. If there are multiple definitions of the same ACLs or Actors, the following file priority is used to resolve conflicts, from highest to lowest priority.

- `$EF_TOP/conf/enginframe/authorization.xconf` (highest priority)
- `$EF_TOP/<VERSION>/enginframe/conf/authorization.xconf` (medium priority)
- `$EF_TOP/conf/plugins/<plug-in>/authorization.xconf` (low priority)
- `$EF_TOP/<VERSION>/enginframe/plugins/<plug-in>/conf/authorization.xconf` (lowest priority)

Modifications to these files are automatically picked up by a running EnginFrame Server, without requiring a restart.

The `authorization.xconf` file is an XML file consisting of two sections:

- An *Actors* section that's introduced with the tag `<ef:acl-actor-list>`
- An *Access Control Lists* section that starts with the tag `<ef:acl-list>`

```
<ef:authorization>
       <!-- EnginFrame Authorization Actors section -->
       <ef:acl-actor-list>
           ...
       </ef:acl-actor-list>
       <!-- EnginFrame Authorization ACL section -->
       <ef:acl-list>
           ...
       </ef:acl-list>
</ef:authorization>
```

Topics

Defining Actors

Actors are entities that can perform actions on resources. In the EnginFrame infrastructure an Actor can be a user, a group of users, or a group of groups of users.

Because an Actor can be a single user or a group, we refer to each component using the term *member*.

There are three ways to define an Actor:

- *efgroup Actor* is an explicit list of members. It can contain one or more users or even other Actors already defined.
- *osgroup Actor* is a list of members that includes the users that belong to the Operating System group that also has the same ID as the Actors associated with it.

- *user Actor* is an actor for a single EnginFrame user. It exists just for "renaming" purposes because usually there's no need to wrap an EnginFrame user ID in an Actor.

The XML syntax that's used to define Actors inside `authorization.xconf` config file is as follows:

```
<ef:acl-actor id="unique_id” type="efgroup|osgroup">
```

An Actor of type `efgroup` must include members defined with the following:

```
<ef:acl-member type="efuser|acl-actor">...</ef:acl-member>
```

Note

When using a member of the `acl-actor` type, the Actor must be defined in the `authorization.xconf` config file.

The following is an Actors section example:

```
...
<!-- EnginFrame Authorization Actors section -->
<ef:acl-actor-list>
  <!-- Actor made up of two simple users and two Actors -->
  <ef:acl-actor id="nice" type="efgroup">
     <ef:info>NICE people</ef:info>
     <ef:acl-member type="efuser">andrea</ef:acl-member>
     <ef:acl-member type="efuser">beppe</ef:acl-member>
     <ef:acl-member type="acl-actor">
        developers
     </ef:acl-member>
     <ef:acl-member type="acl-actor">efadmin</ef:acl-member>
  </ef:acl-actor>
  <ef:acl-actor id="developers" type="efgroup">
     <ef:info>EnginFrame Developers</ef:info>
     <ef:acl-member type="efuser">antonio</ef:acl-member>
     <ef:acl-member type="efuser">mauri</ef:acl-member>
     <ef:acl-member type="acl-actor">goldrake</ef:acl-member>
  </ef:acl-actor>
  <!--
```

```
     Member of this Actor are dynamically loaded from the
     Operating system group “efadmin” using the script:
     NICE_ROOT/enginframe/plugins/myplugin/bin/ef.load.users
     -->
   <ef:acl-actor id="efadmin" type="osgroup" plugin="myplugin"/>
</ef:acl-actor-list>
...
```

Defining access control lists

Access control lists (ACL) define policies that are applied to Actors when they try to perform actions on resources.

The purpose of an access control list (ACL) is to grant or deny permissions on actions that an EnginFrame Actor can perform without reference to a specific resource.

An ACL consists of three main parts. The first section is used to "bias" the ACL towards the `allow` or the `deny` directive. The following two parts define the allow and deny directives where Actors are bound with the actions they can or cannot perform.

The ACL structure explanation follows

- *ACL priority*, defines if the allow or deny directive has priority for this ACL:
  - `allow` priority: By default, access is allowed. The deny directives are evaluated before the allow ones. Any Actor that doesn't match a deny directive or matches an allow directive is allowed access to the resource.
  - `deny` priority: By default, access is denied. The allow directives are evaluated before the deny ones. Any Actor that doesn't match an allow directive or matches a deny directive is denied access to the resource.
- *ACL allow*, contains the allow directives, a list of Actors where a set of actions specifies the operations that the Actor can actually perform on a generic resource guarded by this ACL.
- *ACL deny*, contains the deny directives, a list of Actors where a set of actions specifies the operations that the Actor can't perform on a generic resource guarded by this ACL.

The definition of an ACL adheres to this XML structure:

```
...
  <ef:acl id="unique_id”>
    <ef:acl-priority>allow | deny</ef:acl-priority>
    <ef:acl-allow>
      <ef:actor id=”actor_id”>
        <ef:action-list>
          <ef:read/>
          <ef:execute/>
          ...
        </ef:action-list>
      </ef:actor>
    </ef:acl-allow>
    <ef:acl-deny>
      <ef:actor id=”actor_id”>
        <ef:action-list>
          <ef:read/>
          <ef:execute/>
          ...
        </ef:action-list>
      </ef:actor>
    </ef:acl-deny>
  </ef:acl>
...
```

The `id` attribute of an `ef:actor` can refer to a predefined `ef:acl-actor` or directly to an EnginFrame user ID.

There are four kinds of actions EnginFrame can accept. The action meaning and the consequent EnginFrame behavior depends on the type of the resource that the ACL is applied to. The four kinds of actions are the following:

- `<ef:read/>`
- `<ef:write/>`
- `<ef:execute/>`
- `<ef:delete/>`

Here an example of an ACL definition follows:

```
...
  <ef:acl-list>
    ...
    <ef:acl id="priv-exec">
      <ef:info>Privileged permissions for Admins</ef:info>
      <ef:acl-priority>deny</ef:acl-priority>
      <ef:acl-allow>
        <ef:actor id="efadmin">
          <ef:action-list>
            <ef:read/>
            <ef:write/>
            <ef:execute/>
            <ef:delete/>
          </ef:action-list>
        </ef:actor>
      </ef:acl-allow>
    </ef:acl>
    ...
  </ef:acl-list>
  ...
```

Condition based ACL

An ACL can include some extra conditions on granting access to a resource.

These conditions can take into account the value of session variables, system properties, and `xpath` expressions and be combined using the logical operators: `or`, `and`, `not`, and `equals`.

This is illustrated in the following example.

```
...
<ef:acl-list>
   ...
  <ef:acl id="project-acme">
    <ef:info>
       Privileged permissions for Project ACME
    </ef:info>
    <ef:acl-priority>deny</ef:acl-priority>
    <ef:acl-allow>
       <ef:actor id="company-users">
         <ef:condition>
           <ef:or>
             <ef:and>
               <ef:equals type=”session”
                          id=”project”
                          value=”acme”
                          casesensitive=”true”/>
               <ef:equals type=”session”
                          id=”${project}_responsible”
```

```
                           value=”true”
                           casesensitive=”false”/>
              </ef:and>
              <ef:and>
                <ef:equals type=”session”
                           id=”administrator”
                           value=”true”
                           casesensitive=”false”/>
                <ef:not>
                  <ef:equals type=”property”
                             id=”${EF_USER}”
                             value=”jack”
                             casesensitive=”true”/>
                </ef:not>
              </ef:and>
            </ef:or>
          </ef:condition>
          <ef:action-list>
            <ef:read/>
            <ef:write/>
            <ef:execute/>
            <ef:delete/>
          </ef:action-list>
        </ef:actor>
     </ef:acl-allow>
   </ef:acl>
    ...
</ef:acl-list>
```

A user can access resources guarded by the "project-acme" ACL only if one of the following conditions is true:

- The user belongs to "`company-users`", the session variable "`project`" is present and its value is "`acme`", and the session variable "`acme_responsible`" is set to "`true`" independently from the case of letters.
- The session variable "`administrator`" is “true” independently from case of letters, and it isn't named "`jack`".

The `ef:and` and `ef:or` tags are condition containers. `ef:and` evaluates to true when all of the included conditions evaluate to true. `ef:or` evaluates to true when at least one of its conditions evaluates to true.

The `ef:not` might contain only one condition and it negates the result of its evaluation.

The `ef:equals` tag checks two arguments for equality. The arguments to check are defined by the `type` and by the `id` attributes. The `casesensitive` attribute specifies if the letter case matching is taken into account.

The `type` can refer to three different kinds of values:

Session variables

The value to be checked is a session variable with the specified `id`.

The following is the session variable from the preceding example.

```
<ef:equals type=”session”
          id=”administrator”
          value=”true”
          casesensitive=”false”/>
```

EnginFrame checks if a session variable named `administrator` is defined and its value is `true`.

System properties

The value to be checked is a system property with the specified `id`. EnginFrame system properties are loaded by the JVM, passed to the JVM using the command line (for example, **–Dname=value**), and loaded from the EnginFrame configuration files.

```
<ef:equals type=”property”
          id=”${EF_USER}”
          value=”mary”
          casesensitive=”true”/>
```

EnginFrame checks if the system property named `${EF_USER}` has the value `mary`.

XPath expressions

The value to be checked is the one extracted from the current DOM by the XPath expression specified in the `id` attribute.

```
<ef:equals type=”xpath”
          id=”starts-with(//ef:profile/ef:user/., ‘br’)”
          value=”true”
```

```
            casesensitive=”true”/>
```

EnginFrame checks if the HTML DOM element `//ef:profile/ef:user/text()` starts with `br`.

Configuring HTTPS

HTTPS, Hypertext Transfer Protocol over Secure Socket Layer, is a URI scheme used for secure HTTP connections.

HTTPS is a protocol that adds a layer of encryption to security-sensitive communication such as payment transactions and corporate logons.

During the installation process, EnginFrame installer has an option for Apache Tomcat® to use HTTPS instead of HTTP. By default, EnginFrame installs with the option to use HTTP protocol in the Apache Tomcat® web server.

If you choose the HTTPS option, the installer automatically creates self-signed certificates under the `$EF_TOP/conf/tomcat/conf/certs` directory. It also configures the Apache Tomcat® connector to use HTTPS.

Using signed certificates with EnginFrame

If self-signed certificates aren't suitable for your needs or you already have valid certificates setup for an HTTPS web server, we recommend that you refer to the Apache Tomcat® official documentation when configuring your web server to use your certificates.

Apache Tomcat® provides different setup procedures depending on the specific format of the available certificate.

For example, if using a PEM private key and PEM certificate, the key and certificate must be converted before they are handled by Java™ `keytool` and keystores. This is the best practice that's recommended in the Apache Tomcat® documentation.

First, convert PEM key and certificate into PKCS12 format:

```
$ openssl pkcs12 -export -in <your_CA_signed_PEM_cert>
  -inkey <your_PEM_private.key> -out <your_certificate_name>.p12
  -name tomcat -chain -CAfile <your_root_CA_certificate>
```

Next, import the newly created PKCS12 certificate into a Java™ keystore file:

```
$ $JAVA_HOME/bin/keytool -importkeystore -deststorepass <password>
  -destkeypass <password> -destkeystore tomcat.keystore
  -srckeystore <exported_private_key_and_cert.p12> -srcstoretype PKCS12
  -srcstorepass <password> -alias tomcat
```

If your certificate authority (CA) has intermediate certificates, import them into the keystore file. It's likely that your CA provides instructions on how to do this and how to name certificates. For example, if a CA intermediate certificate is already in a format that's supported by Java™ `keytool`, you can import it this way:

```
$ $JAVA_HOME/bin/keytool -import -alias intermed -keystore tomcat.keystore
  -trustcacerts -file gd_intermediate.crt
```

You might also need to import the root CA certificate into the keystore if it doesn't come from one of the CAs whose root certificates are pre-configured in the Java™ system.

For more information about how to use the keytool and openssl commands, in the Oracle Java SE Documentation.

Configuring SSL/TLS for Hazelcast

Transport Layer Security (TLS) is a cryptographic protocol designed to provide communications security over a computer network.

With Hazelcast you can encrypt socket level communication between Hazelcast members and between Hazelcast clients and members, for end to end encryption.

EnginFrame ships with Hazelcast Open Source which doesn't support the security suite that includes SSL/TLS asymmetric encryption.

Setup SSL/TLS communication with Hazelcast Enterprise

1. To learn how to set up SSL/TLS communication with Hazelcast Enterprise, you need:

- A valid Hazelcast Enterprise license.
- The Hazelcast Enterprise jar (current version 5.1.1.

2. To begin, replace `${EF_ROOT}/WEBAPP/WEB-INF/lib/hazelcast-5.1.1.jar` with the downloaded Hazelcast Enterprise `jar`.
3. After the `jar` is replaced, update the Hazelcast configuration file `${EF_ROOT}/conf/hazelcast.xml` with the license key that you already obtained by following this guide.
4. Implement `com.hazelcast.nio.ssl.SSLContextFactory` and configure the SSL section in the network configuration. Hazelcast provides a default `SSLContextFactory`, `com.hazelcast.nio.ssl.BasicSSLContextFactory`, that uses the keystore to initialize SSLContext. An example configuration for TLS/SSL follows:

```
<hazelcast>
...
<network>
     ...
     <ssl enabled="true">
        <factory-class-name>
            com.hazelcast.nio.ssl.BasicSSLContextFactory
        </factory-class-name>
        <properties>
            <property name="protocol">TLSv1.2</property>
            <property name="mutualAuthentication">REQUIRED</property>
            <property name="keyStore">/efs/KeyStore.jks</property>
            <property name="keyStorePassword">passphrase</property>
            <property name="keyStoreType">JKS</property>
            <property name="trustStore">/efs/truststore.jks</property>
            <property name="trustStorePassword">passphrase</property>
            <property name="trustStoreType">JKS</property>
        </properties>
     </ssl>
</network>
...
</hazelcast>
```

Property descriptions:

- **keyStore**: Path of your keystore file.
- **keyStorePassword**: Password to access the key from your keystore file.

- **keyManagerAlgorithm**: Name of the algorithm based on the provided authentication keys.
- **keyStoreType**: Type of the keystore. Its default value is JKS. Another commonly used type is the PKCS12. Available keystore/truststore types depend on your operating system and Java runtime.
- **trustStore**: Path of your truststore file. The truststore file is a keystore file that contains a collection of certificates trusted by your application.
- **trustStorePassword**: Password to unlock the truststore file.
- **trustStoreType**: Type of the truststore. Its default value is JKS. Another commonly used type is the PKCS12. Available keystore/truststore types depend on your operating system and Java runtime.
- **mutualAuthentication**: Mutual authentication configuration. It’s empty by default which means the client side of connection is not authenticated. Available values are:
  - REQUIRED - server forces usage of a trusted client certificate.
  - OPTIONAL - server asks for a client certificate, but doesn’t require it.

For more information, see the Hazelcast documentation.

5. Follow the next example to properly configure a Keystore and a Truststore that leverages both `keytool` and `openssl` .

```
$ keytool cd /efs
keytool -genkey -alias bmc -keyalg RSA -keystore KeyStore.jks -keysize 2048
openssl req -new -x509 -keyout ca-key -out ca-cert
keytool -keystore KeyStore.jks -alias bmc -certreq -file cert-file
openssl x509 -req -CA ca-cert -CAkey ca-key -in cert-file -out cert-signed -days
 365 -CAcreateserial -passin pass:passphrase
keytool -keystore KeyStore.jks -alias CARoot -import -file ca-cert
keytool -keystore KeyStore.jks -alias bmc -import -file cert-signed
keytool -keystore truststore.jks -alias bmc -import -file ca-cert
```

   With this example, you create a custom CA with `openssl` that's used to sign the Hazelcast certificate. We recommend that you use a publicly available CA for production and reserve the use of custom CA certificates for testing purposes.

6. Restart EnginFrame to leverage SSL/TLS for Hazelcast members and clients communications.

Document history

The following table describes the major updates and new features for the *EnginFrame Administrator Guide*. We also update the documentation frequently to address the feedback that you send us.

Change	Description	Date
NICE EnginFrame End of support notice	NICE EnginFrame End of support notice: On September 25, 2025, AWS will discontinue support for NICE EnginFrame. After September 25, 2025, you will no longer be able to access the NICE EnginFrame console or NICE EnginFrame resources. For more information, visit this blog post.	September 25, 2024
NICE EnginFrame version 2021.0 (revision 1667) released	NICE EnginFrame version 2021.0 (revision 1667) released. Changes: • EnginFrame now ships with Tomcat® 9.0.78 (from 9.0.64). • EnginFrame now ships with Apache® Commons Text 1.10.0 (from 1.9). • EnginFrame now ships with Gson 2.8.9 (from 2.8.x).	August 3, 2023

	• EnginFrame documentation added: Restarting Amazon DCV Session Manager.	
NICE EnginFrame version 2021.0 (revision 1657) released	NICE EnginFrame version 2021.0 (revision 1657) released. Changes: • If updating from a previous EnginFrame instance, you must change the `server.xml` file as described in Updating to EnginFrame version 2021.0-r1653 or later. • Fixed a bug to prevent Tomcat use of HTTPS. Bug fixes: • Fixed a bug to prevent Tomcat use of HTTPS. • Fixed a bug that occurred with the use of AWS Cognito as the authentic ation server for DCVSM.	August 9, 2022

NICE EnginFrame version 2021.0 (revision 1653) released	NICE EnginFrame version 2021.0 (revision 1653) released. Enhancements: • EnginFrame now ships with Tomcat® 9.0.64. Bug fixes: • Fixed a bug that caused global actions not to be shown in spooler view in some cases.	August 5, 2022

NICE EnginFrame version 2021.0 (revision 1646) released	NICE EnginFrame version 2021.0 (revision 1646) released. Enhancements: • EnginFrame can now be used with Java11. • Added support for the `log4j` configuration to be overridden by the top folder configurations. • HPC Connector enables updates to the configura tion of a previously created cluster. Discontinued Integrations: • Discontinued support for the Neutro plugin. Changes: • Updated log4j to version 2.17.2. • Updated Hazelcast to version 5.1.1. • HPC Connector doesn't run any activations (triggers) when disabled. Bug fixes:	June 30, 2022

- Fixed the loading of the jobs list view when `ef_ajax` is enabled.
- Fixed the loading of the jobs inside a spooler when `ef_ajax` is enabled.
- Fixed incorrect menu highlighting when custom menu items are added to the existing ones.
- Fixed jobs global actions not being shown inside a spooler created with `LSF`.
- The multi file upload widget used in services now stretches to the configured height.
- Removed the action menu from the Remote File Browsing widget which was shown erroneously.

NICE EnginFrame version 2021.0 (revision 1592) released	NICE EnginFrame version 2021.0 (revision 1592) released. Enhancements: • Timeout for checking `xdcv` and `dcvagent process-id` is now configurable. Bug fixes: • Fixed a bug introduced in version 2021.0 (revision 1566) preventing access to the portal if updating NICE EnginFrame from a previous version. • Fixed a bug showing an error while loading AWS HPC Connector SDF. • Fixed a bug that kept `dcvsm` sessions stuck in a `Closing` status.	April 20, 2022

NICE EnginFrame version 2021.0 (revision 1566) released	NICE EnginFrame version 2021.0 (revision 1566) released. Enhancements: • Added support for SLURM™ 21.x. • Added *Document history* to the *NICE EnginFrame Administrator Guide*. Discontinued integrations: • Discontinued support for VNC® and Amazon DCV 2016 and previous versions. Changes: • Changed default output limit for job scheduler xml output from 10MB to 50MB. • Changed default log level for AWS HPC Connector to INFO rather than DEBUG. Bug fixes: • Fixed NICE EnginFrame logo not showing up in Firefox® browser. • Fixed `NullPointerException` thrown	April 11, 2022

when `DCVSM` host is stopped.

- Fixed a bug preventing the use of rounded parentheses in Amazon DCV sessions names.
- Fixed cursor disappearing when hovering on an active link.
- Fixed clusters not showing up when `DCVSM` was configured.
- Fixed cluster details not showing up for DCVSM clusters.
- Fixed AWS HPC Connector creating redundant spoolers.
- Fixed `bjobs` line wrapping in LSF®.

NICE EnginFrame version 2021.0 (revision 1388) released	NICE EnginFrame version 2021.0 (revision 1388) released. Enhancements: • Only hosts of clusters in `READY` state are listed. • Clusters that are in the process of being created are not listed. • The cluster ID in the cluster page links to the associate d AWS ParallelCluster CloudFormation stack. • `ef-hpcc` is now used as prefix for session IDs. • Added sorting and searching for clusters and cluster configurations. • Added sorting by name, size and modified columns in the remote spooler page. • Added support for filtering jobs by cluster ID. • Removed limitation on the length of queue and instance names (before, the combined length could not be more than 20 character s). Changes:	January 31, 2022

	• Removed HPC and AWS Batch clusters from session cluster list (for interactive sessions). • HPC cluster job retention is equal to the application TTL. Bug fixes: • Fixed Amazon DCV Session Manager resolution selection widget, however note that this widget is not yet usable because Amazon DCV Session Manager does not support setting the session resolution.	
NICE EnginFrame version 2021.0 (revision 1345) released	NICE EnginFrame version 2021.0 (revision 1345) released. Changes: • Upgraded Log4j to version 2.17.0.	December 21, 2021

NICE EnginFrame version 2021.0 (revision 1332) released	NICE EnginFrame version 2021.0 (revision 1332) released. Changes: • Upgraded Log4j to version 2.17.0.	December 17, 2021
NICE EnginFrame version 2021.0 (revision 1315) released	NICE EnginFrame version 2021.0 (revision 1315) released. Changes: • Upgraded Log4j to version 2.16.0.	December 10, 2021

NICE EnginFrame version 2021.0 (revision 1307) released	NICE EnginFrame version 2021.0 (revision 1307) released. Enhancements: • The *NICE EnginFrame Administrator Guide* is available on AWS. • New AWS HPC Connector plugin adds support for hybrid infrastru ctures enabling launch of HPC Applications on clusters created through ParallelCluster 3 using AWS resources. • Metrics can now be published to external monitoring tools (such as Graphite, Grafana, CloudWatch) through StatsD. • A keystore can now be used to store DB admin credentia ls. Changes: • Upgraded to AWS ParallelC luster 3.0.0 and AWS ParallelCluster Batch CLI 1.0.0. Refer to the EnginFrame Administr ator Guide for a smoother	December 6, 2021

upgrade than previous releases.

- Applications Portal has been renamed to Workspace.
- Views Portal has been renamed to Virtual Desktops.
- Administration Portal has been renamed to Operational Dashboard.

Discontinued Integrations:

- Discontinued support for Neutro.

Bug fixes:

- Fixed an issue that prevented the host setup script to work correctly when selecting the start at boot option.

Known Issues:

- AWS HPC Connector allows a maximum length of 20 characters for the queue name and instance name combined. In order to overcome this limitation it is currently required to disable the job cache.

NICE EnginFrame version 2020.1 (revision 762) released	NICE EnginFrame version 2021.0 (revision 762) released. Enhancements: • TurboVNC sessions now require TLS 1.2 connections in order to be established. Changes: • Upgraded JQuery-UI to 1.12.1 version. • Miscellaneous security improvements. Discontinued Integrations: • Discontinued support for RealVNC®. • Discontinued support for TigerVNC. • Discontinued support for HP® RGS. • Discontinued support for Amazon DCV prior 2017.0 version. • Discontinued support for Torque. • Discontinued support for LSF® prior 10.1.x version.	August 13, 2021

	• Discontinued support for PBS Professional® versions 7.x - 14.x. • Discontinued support for Son of Grid Engine (SoGE) version 6.2. • Discontinued support for Open Grid Scheduler. • Discontinued support for Oracle® Grid Engine. Bug fixes: • Fixed display of multiple uploaded files. • Fixed an issue with sessions disappearing on some rare circumstances. • Fixed an issue when a service under ACL was not shown or denied access by error.	
NICE EnginFrame version 2020.1 (revision 492) released	NICE EnginFrame version 2021.0 (revision 492) released. Bug fixes: • Fixed an issue in Amazon DCV Session Manager plugin not working on some on-premises scenarios.	June 3, 2021

NICE EnginFrame version 2020.1 (revision 413) released	NICE EnginFrame version 2021.0 (revision 413) released. Bug fixes: • Fixed an issue in the service editor which prevented services from being saved. • Fixed an issue in SLURM™ showing sessions as closed on some circumstances.	May 6, 2021

NICE EnginFrame version 2020.1 (revision 385) released	NICE EnginFrame version 2021.0 (revision 385) released. Changes: • Upgraded Amazon DCV Session Manager client to the latest version (2021-04-06). Enhancements: • Added support for SUSE® Linux® Enterprise Server 12 SP 5. • Added support for SUSE® Linux® Enterprise Server 15 SP 2. • Added support for Red Hat® Enterprise Linux® 8. • Added support for multiple SLURM™ clusters. • Added support for node monitoring in Amazon DCV Session Manager. • Added support for `auto-run` file in Amazon DCV Session Manager. • Added the possibility to choose between Console and Virtual Linux® sessions in Amazon DCV Session Manager.	April 28, 2021

- Added session screensho t as session thumbnail in Amazon DCV Session Manager.
- Improved performances of Spoolers listing.

Bug fixes:

- Fixed an issue introduce d in 2020.0-r197 which prevents triggers from running correctly and interactive sessions to get updated. If you are using 2020.0-r197 and experience issues with either triggers or interacti ve sessions, please contact us via https://support.nice-software.com.
- Fixed an issue in SLURM™ showing sessions as closed on some circumstances.

NICE EnginFrame version 2020.0 (revision 197) released	NICE EnginFrame version 2020.0 (revision 197) released. Changes: • When running on Amazon EC2, the NICE EnginFrame server periodically connects to an Amazon S3 bucket to determine whether a valid license is available. Please see the documentation for more details. • Added support for Red Hat® and Corretto JDKs. • Miscellaneous security improvements. Bug fixes: • Fixed lock bug on service editor. • Fixed bug on color theme editor.	February 16, 2021

NICE EnginFrame version 2020.0 (revision 91) released	NICE EnginFrame version 2020.0 (revision 91) released. Changes: • The `SpoolerDetails` class included in `ef.scriptlets.jar` has been transformed into an interface. In case you are using `SpoolerDetails` in compiled code, you need to recompile your integrati on. • Miscellaneous security improvements. Bug fixes: • Fixed forward slash bug in Amazon DCV Session Manager broker endpoint configuration.	December 14, 2020

NICE EnginFrame version 2020.0 (revision 58) released	NICE EnginFrame version 2020.0 (revision 58) released. Enhancements: • Refreshed user interface ! New typography, layout, color and iconography. • Running NICE EnginFrame on Amazon EC2 no longer requires a license. • New support for Amazon DCV Session Manager (requires Amazon DCV 2020.2+). • Updated MySQL® support to version 8.0.x. • Added OpenPBS® support for versions 19.1.x and 20.0.x. • Updated Altair® PBS Professional® support to 19.2.x and 2020.1.x. • Updated SLURM™ support to 19.05.x and 20.02.x versions. Deprecated integrations: • Deprecated support for LSF® versions 9.x and earlier. • No longer supporting LSF® version 6.x and earlier.	November 17, 2020

- Deprecated support for Altair® PBS Professional® versions 17.x and earlier.
- Deprecated support for Torque versions 6.x.
- No longer supporting SLURM™ 17.x and earlier.
- Deprecated support for Son of Grid Engine (SoGE).
- Deprecated support for Oracle® Grid Engine.
- Deprecated support for Open Grid Scheduler.
- Deprecated support for RealVNC®, TigerVNC and HP® RGS.
- Deprecated support for TurboVNC versions 2.1.x and earlier.
- Deprecated support for Amazon DCV versions 2016.x and earlier.
- Deprecated support for Neutro.
- Removed support for Moab Web Services.
- Removed support for XenDesktop and Citrix Receiver.

Bug fixes:

- Fixed File Manager SSH backend.

	• Fixed a problem when updating and specifying the currently used license file.	
NICE EnginFrame version 2019.0 (revision 1537) released	NICE EnginFrame version 2019.0 (revision 1537) released. Changes: • Updated Apache Tomcat® to version 7.0.105. • Updated Apache® Derby to version 10.14.2.0. • Upgraded Web Services framework from Apache® Axis1 1.4 to Axis2 1.7.9. Bug fixes: • Fixed a regression in the update of the Apache Derby® policies. • Fixed a regression that prevent using IDN character s in service submission. • Several UI and minor bug fixes and improvements.	July 17, 2020

NICE EnginFrame version 2019.0 (revision 1434) released	NICE EnginFrame version 2019.0 (revision 1434) released. Bug fixes: • Fix file download when using HTTP protocol.	April 10, 2020

NICE EnginFrame version 2019.0 (revision 1424) released	NICE EnginFrame version 2019.0 (revision 1424) released. Enhancements: • Added configuration parameter to limit file upload size (default is 4GB) in the server.conf file. • Added configuration parameter to set auto-refresh period for `list.jobs` and `list.all.jobs` services in the `ui.hydrogen.conf` file. • Added configuration parameters for screenshot and logs refresh rate. • Extended job history to 14 days in job details page for PBS and TORQUE. • Added Microsoft® Edge support. Changes: • Updated Apache Tomcat® to version 7.0.100. • Updated Apache Derby® to version 10.12.1.1. • Dropped Java7 support. • Miscellaneous security improvements.	April 3, 2020

Bug fixes:

- Fix support of file manager subfolders when using EnginFrame WebServices client.
- Fix usage of Amazon DCV commands to be compatibl e with all the Amazon DCV 2017+ versions.
- Fix `dcv create-se ssion` command composition to support paths with spaces.
- Fix update credentials when removing sharing permission from a previousl y shared session (Amazon DCV 2016).
- Fix pids list retrieval.
- Fix host parsing to correctly map the `IDLE+DRAIN` state (SLURM™).
- Unset `SQUEUE_USERS` to avoid jobs filtering during retrieval of all jobs information (SLURM™).

NICE EnginFrame version 2019.0 (revision 915) released	NICE EnginFrame version 2019.0 (revision 915) released. Enhancements: • Added support for MySQL® 5.7 and MariaDB® 5.5. Changes: • Removed "Create New Plugin" service from the Administration portal. • Miscellaneous security improvements. Bug fixes: • Fix vroot management for folders containing regex-res erved characters. • Fix vroot creation for `HOME` folder. • Fix retrieval of Amazon DCV agent pid when the username is numeric (Amazon DCV 2017). • Fix the job id parsing (LSF®). • Support the LSF® option to specify the login shell for the interactive session job.	March 1, 2019

- Fix job name parsing when containing the percent sign (SGE).
- Added `-X` option to the sacct command to avoid to parse job steps (SLURM™).
- Fix host information parsing (Torque).

NICE EnginFrame version 2019.0 (revision 848) released	NICE EnginFrame version 2019.0 (revision 848) released. Enhancements: • Added AWS Batch as supported AWS native job scheduler. • Added Amazon S3 file manager backend used with AWS Batch workflows. • Use `dcv describe-session` to get the Amazon DCV display. • Miscellaneous security improvements. Changes: • Updated Apache Tomcat® to version 7.0.92. Bug fixes: • Fix job arrays filtering. • Fix job actions in multi-sch eduler environment. • Fix sample compress job service in multi-scheduler environment. • Avoid duplicate job records when using Oracle® DBMS.	January 23, 2019

	• Fix output path parsing (PBS Professional®).	
NICE EnginFrame version 2017.2 (revision 641) released	NICE EnginFrame version 2017.2 (revision 641) released. Enhancements: • Improve execution-host presentation to show number of cores and avoid host duplication. • Improved visualization and internal representation of parallel jobs (LSF®). • Speed up array job management (SGE). Bug fixes: • Avoid to save reuse-spooler information in the Service Profile. • Fix Oracle® 12 DBMS support when autocommit is enabled. • Fix a regression in HTTP authentication process that prevented the user mapping at login time. • Fix queue name parsing (SGE).	September 21, 2018

NICE EnginFrame version 2017.2 (revision 548) released	NICE EnginFrame version 2017.2 (revision 548) released. Bug fixes: • Applications/VDI: fix the user list autocompletion in sharing dialog.	July 5, 2018

NICE EnginFrame version 2017.2 (revision 520) released	NICE EnginFrame version 2017.2 (revision 520) released. Enhancements: • New configuration file to customize the generation of URL tuples (host, port, web URL path) for Amazon DCV 2017 sessions. • Added two new extension points (hooks) to the interactive session life cycle. One hook is called when the session is ready to pass to the 'Running' state while the other when the session terminates. Added sample hook scripts for the dynamic configuration of the AWS Application Load Balancer for Amazon DCV 2017 sessions. • Amazon DCV 2017 web URL path configuration parameter is retrieved dynamically from the Amazon DCV server configuration. • Enable folder tree upload through drag and drop to the Multiple File Upload (MFU) widget. Currently working on Firefox®,	April 17, 2018

Chrome™, Microsoft® Edge but not on Microsoft® Internet Explorer®.

- Improved management of the web browser pop-up blocker when connecting to Amazon DCV 2017 sessions. * Added support for `--storage-root` /`--max-concurrent-clients` parameters when launching Amazon DCV 2017 session.
- Improved Amazon DCV session scheduling process robustness and logging.
- Applications/VDI: improved the import of a set of users from a CSV file.
- Updated the parsing of hosts features for SLURM™ versions 16 and 17.

Bug fixes:

- Applications/VDI:

  Fix service editor layout that was broken when zooming in and out.

  Fix issue with service editor for interactive services, disappearing unsaved changes.
- Applications: fix the selection of the value for

"List of Queues" and "List of Hosts" input fields on service resubmit.

- Admin portal: fix "Run Self Checks" and "Collect Support Info" services.
- Fix dynamic spooler feature that allows to use session variables in the spooler directory path.
- Fix the support for custom GPU load balancer script for Amazon DCV 2017 sessions.
- Fix interactive screenshot thumbnail with ImageMagi ck 7.07 / Sles 12.3.
- Added missing fullscree n and use-all-monitors parameters to the Amazon DCV 2017 connection file used by the Amazon DCV desktop client.
- UI: preserve job ordering field in the table for a job array.
- Fix job parsing for User Group and Project fields (LSF®).
- Fix PBS `qstat` error management for unknown jobs.
- Several UI and minor bug fixes and improvements.

NICE EnginFrame version 2017.1 (revision 313) released	NICE EnginFrame version 2017.1(revision 313) released. Enhancements: • Enable Amazon DCV 2017 session sharing on Linux®. • Set initial display resolutio n for Amazon DCV 2017 sessions on Linux®. • Add the possibility to configure the port used by the Amazon DCV 2017 Server. • Add support for OpenGL optimizations option "--dcv2-gl on|off" at Amazon DCV 2017 sessions submission time. • Avoid to disclose Apache Tomcat® server info in the HTTP responses. Bug fixes: • Correctly handle the xstartup initialization scripts for Amazon DCV 2017 sessions. • Fix bug that prevented Amazon DCV 2017 sessions to start on an EnginFram e 2017.1 installed as an	April 17, 2018

	update from a previous version. • Fix parameter passing for Amazon DCV 2017 sessions. • For Amazon DCV 2017 connections apply both `nat.conf` and `proxy.conf` as it works for VNC® / Amazon DCV 2016. • Correctly handle a large number of jobs (PBS Professional®). • Fixed job name that had an extra _ character (LSF®).	
NICE EnginFrame version 2017.1 (revision 291) released	NICE EnginFrame version 2017.1(revision 291) released. Bug fixes: • Actions on Triggers view in the Administration portal. • Fix support for JDK 7. • Session sharing on Amazon DCV 2016.	November 13, 2017

NICE EnginFrame version 2017.1 (revision 285) released	NICE EnginFrame version 2017.1(revision 285) released. Enhancements: • Support for Amazon DCV 2017 on Linux® and Windows® platforms. • Updated EF-on-AWS deployment solution to CfnCluster 1.3.2. • Added support for Son of Grid Engine (SoGE). Changes: • Updated Apache Tomcat® to version 7.0.82. • EF-on-AWS trial deploymen t solution has been extended to Asia Pacific (Sydney) region (ap-south east-2). Bug fixes: • Applications/VDI: 'list of queues' widget shows the correct queues allowed to the current user. • Correctly handle multiple SGE flavors:	November 7, 2017

Job name sanitization that changes accordingly to the flavor.

Son of Grid Engine (SoGE) job submission, the scheduler returns exit code 1 when jobs go pending.

- Fix for jobs with single digit id that now correctly appear in NICE EnginFrame (PBS Professional®).
- NICE EnginFrame Jobcache 'cluster' field has been extended in order to support longer cluster id as in the case of PBS and Torque that use the fqdn by default.
- NICE EnginFrame with HTTPS installation: set the hostname into the CN of the EnginFrame Server self-signed certificate. Otherwise IE11 couldn't trust the certificate.
- Several UI and minor bug fixes and improvements.

NICE EnginFrame version 2017.0 (revision 41570) released	NICE EnginFrame version 2017.0 (revision 41570) released. Enhancements: • Amazon Linux support: NICE EnginFrame installs and works on Amazon Linux. • New NICE EnginFrame license type to support AWS test environments. • New HTML5/JS multiple/ single file upload widget for NICE EnginFrame service options to replace Java™ Applet implementation with support for server-side file caching. • Support for Citrix(R) XenDesktop(R) as interacti ve back-end to launch and manage sessions for published interactive applications. • New authentication mechanism based on X509 certificates. This applies to HTTPS protocol as authenticated and encrypted communica tion channel and user's	March 27, 2017

authentication into NICE EnginFrame.

- Input option validation with regex pattern (feature not yet exposed in the Applications/VDI service editor). All NICE EnginFrame system services now apply built-in input validation patterns.
- Interactive plugin renews VNC® session credentials when changing the set of collaborators. It also supports VNC® password expiration through a configurable `time-to-live` .
- Improved Showcase demo portal with new examples for service re-submission and `ef:action` functionalities.
- Improved configuration of the default `mime-type` for file download.
- Spooler area adapts its size to the number of items to display.
- Applications/VDI:

  Service editor allows to create new actions on files using services. Newly created actions appear in the drop down list when users select files in the file manager or spooler views.

New Unzip file service to demonstrate file action feature.

Per service custom CSS and JavaScript®.

New service to export users and groups into a csv file.

It's possible to customize the set of services in Data and Monitor folders (top menu services) for both the User and Admin portals.

Added help tooltips in the Service Editor.

- Installer allows to enable HTTPS protocol for EnginFrame Server / Tomcat®.
- EnginFrame Server and Agent communicate with RMI over SSL.
- New account lockout feature after a configura ble number of failed login attempts.
- File system hardening: improved ownership and permissions for directories containing sensitive data.

- Miscellaneous security improvements.
- New client API to submit and manage interacti ve sessions with Java™ EnginFrame WebServices client library.

Changes:

- Updated Apache Tomcat® to version 7.0.75.
- Java™ Applet widgets for multiple/single file upload options and multiple file download functionality have been disabled by default.
- Vertical demo sites bio, eda and mda have been removed.

Bug fixes:

- EnginFrame license check during installation.
- Lock management in Applications/VDI service editor.
- Fixed statistics informati on when EnginFrame is deployed on Amazon Elastic File System file system.
- Error management with remote file browsing.

- IBM® Platform™ LSF® version retrieval on Windows®.
- Fixed cpu and jobname management (SLURM™).
- Fixed host info details. (SLURM™).
- Fixed job arrays management. (SGE).
- Set umask value to 022 at EnginFrame process startup so the newly created directory have proper permissions.
- Fixed a minor issue reported in EnginFrame log files concerning expired connections to the DBMS after idle time.
- Several UI aspects have been fixed and improved.
- Java™ EnginFrame WebServices client library:

  Fixed management of client logout and re-authen tication.

  Fixed input option setting when preparing a service submission.