# Table of Contents

FME Server Admin 1.1
About This Document 1.2

Course Overview 1.2.1
Course Resources 1.2.2

Chapter 1: Planning an FME Server Installation 1.3
Requirements for FME Workspaces 1.3.1
Installation Types 1.3.2
FME Server Architecture 1.3.3
Planning for Fault Tolerance 1.3.4
Disaster Recovery 1.3.5
Security Updates 1.3.6
Licensing FME Server 1.3.7
Chapter Review 1.3.8

Chapter 2: FME Server Connectivity 1.4
Firewalls and Ports 1.4.1
DNS 1.4.2
CORS 1.4.3
Chapter Review 1.4.4

Chapter 3: FME Server Security 1.5
Role- and User-Based Access 1.5.1
Security Policies 1.5.2
Exercise 1: Creating A New User 1.5.3
Running Services without Authentication 1.5.4
Running FME System Services under Different Accounts 1.5.5
Active Directory and FME Server 1.5.6
Exercise 2: Configuring Active Directory/LDAP 1.5.7
HTTPS/SSL and FME Server 1.5.8
Exercise 3: Configuring for HTTPS 1.5.9
Chapter Review 1.5.10
Q&A Answers 1.5.11

Chapter 4: Migration and Upgrades 1.6
Backup and Migration 1.6.1
Backup Configuration Files 1.6.2
Exercise 1: Backup and Migration 1.6.3
Upgrading FME Server 1.6.4
Projects 1.6.5
Chapter Review 1.6.6
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q&amp;A Answers</td>
<td>1.6.7</td>
</tr>
<tr>
<td>Chapter 5: Scalability and Performance</td>
<td>1.7</td>
</tr>
<tr>
<td>Job Queues</td>
<td>1.7.1</td>
</tr>
<tr>
<td>Exercise 1: Job Queues</td>
<td>1.7.2</td>
</tr>
<tr>
<td>Adding FME Engines on a Separate Machine</td>
<td>1.7.3</td>
</tr>
<tr>
<td>Changing Database Provider for FME Server Database</td>
<td>1.7.4</td>
</tr>
<tr>
<td>Exercise 2: Changing the FME Server Database Provider</td>
<td>1.7.5</td>
</tr>
<tr>
<td>System Cleanup</td>
<td>1.7.6</td>
</tr>
<tr>
<td>Chapter Review</td>
<td>1.7.7</td>
</tr>
<tr>
<td>Q&amp;A Answers</td>
<td>1.7.8</td>
</tr>
<tr>
<td>Chapter 6: FME Server Customization</td>
<td>1.8</td>
</tr>
<tr>
<td>Server Dashboards</td>
<td>1.8.1</td>
</tr>
<tr>
<td>32- and 64-bit Engines on Same Machine</td>
<td>1.8.2</td>
</tr>
<tr>
<td>Configuring Custom Coordinate Systems/Grid Transformations</td>
<td>1.8.3</td>
</tr>
<tr>
<td>Using Python with FME Server</td>
<td>1.8.4</td>
</tr>
<tr>
<td>Using R with FME Server</td>
<td>1.8.5</td>
</tr>
<tr>
<td>Adding Shared Resources</td>
<td>1.8.6</td>
</tr>
<tr>
<td>Database Connections</td>
<td>1.8.7</td>
</tr>
<tr>
<td>Web Connections</td>
<td>1.8.8</td>
</tr>
<tr>
<td>Exercise 1: Web Connections</td>
<td>1.8.9</td>
</tr>
<tr>
<td>Chapter Review</td>
<td>1.8.10</td>
</tr>
<tr>
<td>Q&amp;A Answers</td>
<td>1.8.11</td>
</tr>
<tr>
<td>Chapter 7: Troubleshooting</td>
<td>1.9</td>
</tr>
<tr>
<td>Initial Troubleshooting</td>
<td>1.9.1</td>
</tr>
<tr>
<td>FME Server Log Files</td>
<td>1.9.2</td>
</tr>
<tr>
<td>Additional Troubleshooting</td>
<td>1.9.3</td>
</tr>
<tr>
<td>Knowledge Center</td>
<td>1.9.4</td>
</tr>
<tr>
<td>Course Wrap-Up</td>
<td>1.10</td>
</tr>
<tr>
<td>Product Information and Resources</td>
<td>1.10.1</td>
</tr>
<tr>
<td>Community Information and Resources</td>
<td>1.10.2</td>
</tr>
<tr>
<td>Feedback and Certificates</td>
<td>1.10.3</td>
</tr>
<tr>
<td>Thank You</td>
<td>1.10.4</td>
</tr>
</tbody>
</table>
FME Server Administration Training Manual

This is the manual for the training course System Administration for FME Server.

The training will assist you to install and administer an FME Server installation and its users.

Course Structure

The full course is made up of seven sections. These sections are:

- Planning an FME Server Installation
- FME Server Connectivity
- Scalability and Performance
- FME Server Customization/Enterprise
- Migration and Upgrades
- FME Server Security
- Troubleshooting

Current Status

The current status of this manual is: COMPLETE. This manual CAN be used for training.

This manual applies to FME2017.1

The status of each chapter is:

- Chapter 0: Complete content. No exercises
- Chapter 1: Complete content and exercises
- Chapter 2: Complete content and exercises
- Chapter 3: Complete content and exercises
- Chapter 4: Complete content and exercises
- Chapter 5: Complete content and exercises
- Chapter 6: Complete content and exercises
- Chapter 7: Complete content. No exercises
- Chapter 8: Complete content. No exercises
**NB:** Even for completed content, Safe Software Inc. assumes no responsibility for any errors in this document or their consequences, and reserves the right to make improvements and changes to this document without notice. See the full licensing agreement for further details.
About This Document

This is the manual for the training course System Administration for FME Server.

Look out for residents of the City of Interopolis, who will appear from time-to-time to give you advice and dispense FME-related wisdom. In fact, here comes someone now:

Mr. E.Dict (Attorney of FME Law) says...

On behalf of the City of Interopolis, welcome to this training course. Here is the standard legal information about this training document and the datasets used during the course. Be sure to read it, particularly if you’re thinking about re-using or modifying this content.

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Data Sources
City of Vancouver

Unless otherwise stated, the data used here originates from open data made available by the City of Vancouver, British Columbia. It contains information licensed under the Open Government License - Vancouver.

Others

Forward Sortation Areas: Statistics Canada, 2011 Census Digital Boundary Files, 2013. Reproduced and distributed on an "as is" basis with the permission of Statistics Canada. © This data includes information copied with permission from Canada Post Corporation.

Digital Elevation Model: GeoBase®

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Document Information

Document Name: FME Server Administration Training Manual 2017

All screenshots relate to FME Desktop and FME Server 2017.1; This manual has been tested with FME Desktop and FME Server 2017.1 Build 17539.
Course Overview

This training material covers how to install and administer FME Server.

The training will introduce the techniques and information required to efficiently manage FME Server and to troubleshoot any problems that might arise.

Prerequisites

This course assumes experience with FME Server. It is recommended to have completed the FME Server Authoring Course, and at least the Getting Started with FME Desktop and FME Server tutorials. Completion of the FME Desktop Basic and Advanced courses are suggested, though not necessary, to gain an understanding of the basic concepts and practices for FME. Knowledge of enterprise level security and IT configurations is helpful, but not required.

Course Structure

The full course is made up of seven sections. These sections are:

- Planning an FME Server Installation
- FME Server Connectivity
- FME Server Security
- Migration and Upgrades
- Scalability and Performance
- FME Server Customization
- Troubleshooting

The instructor may choose to cover as many of these sections as they feel are required, or possible in the time permitted. They may also cover the course content in a different order and will skip or add new content to better customize the course to your needs.

Therefore the length and content of the course may vary, particularly when delivered online.

About the Manual

The FME Server administration training manual not only forms the basis for FME Server training – in-person or online – but is also useful reference material for future work you may undertake with FME.

This training material is designed specifically for use with FME2017.1. You may not have some of the functionality described if you use an older version of FME.

Note to Instructors

This training manual requires additional configuration and support of third-party software to complete the exercises as they are written.

- **Configuring for Active Directory:** To complete this exercise, training machines need to belong to a domain network and have access to Active Directory listings. Domain credentials must be provided in order to access Active Directory listings.
- **Changing the FME Server Database Provider:** To complete this exercise, training machines must have access to an external database where the schema for the FME Server database can be configured. A local installation of PostgreSQL is
used in this exercise, but Oracle or Microsoft SQL Server are alternatives. The database does not have to be local.

- **Web Connections:** To complete this exercise, a third-party web service with OAuth 2.0 authentication must be used. Dropbox is used in this exercise, but there are many other options. The web service does not need to have transformers available in FME – it is possible to leverage the HTTPCaller transformer for this purpose. It will be necessary to share Client Id and Client Secret credentials in order to configure the web service in FME Server.

- **Dashboards:** An exercise in this training manual configures FME Server with a self-signed certificate (Exercise: Configuring for HTTPS). The existing JobHistoryStatisticsGathering.fmw workspace is NOT compatible and must be replaced with JobHistoryStatisticsGathering_SelfSignedCert.fmw – this file is available in FMEData2017/Workspaces/ServerAdmin – either a new Schedule can be created or an update to the original.
Course Resources

A number of sample datasets and workspaces will be used in this course.

On Your Training Computer

The following applications may already be installed, licensed, and located on your training computer (real or virtual):

- Java Virtual Machine
- Apache Tomcat
- FME Desktop Version 2017.1
- FME Server Version 2017.1
- PostgreSQL / PostGIS

The data used in this training course is based on open data from the City of Vancouver, Canada.

Most exercises ask you to assume the role of a city planner at the fictional city of Interopolis and to solve a particular problem using this data.

Whether it's a local computer or a virtual computer hosted in the cloud, you'll find resources for the examples and exercises in the manual at the following locations:

<table>
<thead>
<tr>
<th>Location</th>
<th>Resource</th>
</tr>
</thead>
<tbody>
<tr>
<td>C:\FMEData2017\Data</td>
<td>Datasets used by the City of Interopolis</td>
</tr>
<tr>
<td>C:\FMEData2017\Resources</td>
<td>Other resources used in the training</td>
</tr>
<tr>
<td>C:\FMEData2017\Workspaces</td>
<td>Workspaces used in the student exercises</td>
</tr>
<tr>
<td>C:\FMEData2017\Output</td>
<td>The location in which to write exercise output</td>
</tr>
<tr>
<td>&lt;documents&gt;\FME\Workspaces</td>
<td>The default location to save FME workspaces</td>
</tr>
</tbody>
</table>

You should also find a digital copy of this manual.

Please alert your instructor if any item is missing from your setup.

You can find the latest version of FME Desktop and FME Server for Windows, Mac, and Linux - together with the latest Beta versions - on the Safe Software web site.

Course Etiquette

For online courses, please consider other students and test your virtual machine connection before the course starts. The instructor cannot help debug connection problems during the course!

For live courses, please respect other students’ needs by keeping noise to a minimum when using a mobile phone or checking e-mail.
Planning an FME Server Installation
Requirements for FME Workspaces

FME Workbench is used to author and publish the workspaces used by FME Server. FME Workbench is not part of FME Server; rather, it is a part of the FME Desktop product. If you do not have access to FME Desktop, you cannot publish workspaces to FME Server, although you can still perform and test the installation.

The version of FME Workbench you use must match the FME Server version you have installed. This requirement ensures that the workspaces you author will run when published to FME Server. If you are running a FME Server version that is older than your FME Workbench, it is possible to upgrade the FME Engines used by FME Server to match your FME Workbench version. For example, FME Desktop 2017.0.x can publish to FME Server with 2017.0.x or 2017.1.x Engines – however, FME Desktop 2017.1 can publish to FME Server with 2017.1.x Engines but NOT FME Server with 2017.0.x Engines.

Web Connections allow FME Workbench to connect to FME Server using the HTTP protocol. It requires the Web Application Server port to be open to communication between the FME Workbench computer and the FME Server computer.

GridShift Files

If you plan to run workspaces that transform data between datums NAD27 and NAD83, you can use datum shift files for Canada or the US.

Third-Party Applications for FME

FME Workspaces often rely on third party applications for connecting to data sources. Examples include an Oracle client for connecting to an Oracle database and an ArcGIS installation for connecting to Esri Geodatabases. If you must install a third-party application for your FME Desktop installation, repeat that installation on your FME Server computer.

Mr. Fibble says...

To perform data transformations, FME Server runs workspaces that have been created with FME Workbench. When a workspace runs on FME Server, it is referred to as a job.
Installation Types

There are three options when you install FME Server: Express, Custom/Distributed, or Engine.

**Express Installation**

The Express option allows you to package all the components, or layers, of the FME Server architecture into a single machine. It is the quickest and easiest of the installation options since all components are provided for you, and you only need to provide a single server to host the installation.

Use the Express installation for any of these scenarios:

- You are not concerned about planning for 2- or 3-tier architecture or fault tolerance. You want to get started quickly with a single installation of FME Server.
- You want to implement an Active-Active architecture for fault tolerance and/or high capacity. In this scenario, you conduct multiple Express installations (as many as you plan for your network), which you link together using your third-party load balancer.

**Custom/Distributed Installation**

Another option is to install with the Distributed option, often referred to as an N-tier Installation. With Distributed, you can physically distribute the components into 3-tier or 2-tier configurations:
A 3-tier architecture distributes the FME Server Web Services, FME Server Application (including the FME Server Core and FME Engines), and the FME Server Database across three physically separate servers. If you choose 3-tier architecture, you must provide and manage:

- A web application server to run the FME Server Web Services. You can run the FME Server Web Services on your own servlet (Apache Tomcat and Oracle WebLogic are supported), or use an Apache Tomcat servlet provided with the installation.
- A database server to host the FME Server Database (Oracle, PostgreSQL, and SQL Server are supported).
- A remote file system to host shared resources.

With 2-tier architecture, an Apache Tomcat servlet is provided to run the FME Server Web Services, and is installed along with the FME Server Core and Engines. Only FME Server Database is installed separately, on a server you provide, along with a remote file system.

**Benefits of an N-tier Architecture**

Implementing a 2- or 3-tier architecture is good if you want to keep components separate so that each can be managed by the appropriate expert team, or if you want to implement an Active-Passive system for failover. You also have finer control over applying security updates to the FME Server Web Application and Database servers when you supply your own. If you use the default FME provided components, you do not have the same amount of control for security.

**Implementing an N-tier Architecture**

You can implement an N-tier architecture by:

1. Choosing one of the Distributed Installation options at installation time, or
2. After an Express installation, by performing one or both of the following reconfigurations:
   - Moving the Web Applications Server to another machine.
   - Changing the database provider for the FME Server Database.
**Engine Installation**

The third option for FME Server installation is an Engine-only installation. The Engine installation allows you to build onto a current FME Server installation by adding FME Engines on a separate machine for fault tolerance and/or high capacity. By installing additional FME Engines on a separate computer from the FME Server Core, you can add processing capacity to your FME Server.

**Silent Installation**

There is also the option for Silent installation with either Linux or Windows.

When performing a Silent installation, you can override any default installation properties to customize the installation. Installation properties can be set in advance or run with their default values.

The following command is an example of a silent installation on Windows for an install with all default options (similar to an Express install), with logging enabled:

```
msiexec /i fme-server-2017.1.1-b17650-win-x64.msi /qb /norestart /l*v installFMEServerLog.txt
```
FME Server Architecture

FME Server has a number of components, some of which are considered part of the FME Server Core and others that are considered Clients of FME Server.

FME Server Clients include:

- Web Services (for example, the Job Submitter Service).
- Web Clients of FME Server such as the web interface.
- Non-Web Clients of FME Server, which include the FME Server Console, FME Workbench, and any custom application that uses the FME Server REST API.

Components that are part of the FME Server Core include:

- Process Monitor
- Repository Management
- FME Server Database
- Repository File System
- FME Engines
- Scheduling Manager
- Relay Manager
- FME Server Notifications
- WebSocket Server

FME Server Architecture Diagram
FME Server Components

The main components of FME Server to be aware of are:

- FME Engines: To carry out data transformation processing
- Server Core: To queue jobs, handle scheduling and notifications, and manage load balancing
- Web Services: To handle networking capabilities

FME Engines
FME Engines process job requests by running FME Workspaces. This is the same core engine, carrying out the same processing, that is used by FME Desktop. An FME Server installation can possess multiple engines.

Each FME Engine processes a single request at a time, and FME Server processing can be scaled by adding FME Engines to the same computer or to separate computers within a distributed FME Server environment.

**Server Core**

The FME Server Core manages and distributes job requests (queuing, request routing, scheduling), the repository contents (workspaces, custom formats, custom transformers, data), and notification requests.

The FME Server Core contains a Software Load Balancer (SLB) that distributes jobs to available FME Engines.

**Web Services**

Much of the FME Server networking capabilities are handled using what we call "Services". Services are software whose interface provides communication between server and clients.

FME Server has a number of services:

- Data Download
- Data Upload
- Data Streaming
- Job Submitter
- KML Network Link
- Token Security
- REST
- Notification

Some services (for example, Data Download) are “transformation” services that carry out data transformation, whereas others (for example, Token) are non-transforming “utility” services.

The Web Application Server is required in order to run the FME Server web interface, FME Server Web Services, and any other web clients. The web interface is included with FME Server and can be run in a browser. Custom web clients can be developed on top of the FME Server REST API.
Planning for Fault Tolerance

Fault tolerance, or “high availability”, is critical to any successful business operation. To ensure that requests are processed in the event of failure, FME Server supports configuring fault tolerance throughout the multiple levels of an integrated system. FME Server provides fault tolerance in the following ways:

1. **Recovery**: Restarting components and jobs when crashes occur. FME Server provides component and job recovery automatically - no additional planning is needed.

2. **Failover**: Ensuring there is no single point of failure. Two different configurations can be used to achieve this: *Active-Passive* or *Active-Active*. Failover is the primary consideration for the type of installation architecture you decide to implement and that you are in charge of managing.

Recovery

Component Recovery

FME Server comes out-of-the-box with component recovery. This means that, even on a single system, FME Server monitors and restarts components that fail, including the FME Engines and the FME Server Core. This is achieved through the FME Server Process Monitor. The ability for FME Server to monitor its own components ensures reliable uptime and dependability.

Job Recovery

FME Server also includes the ability to restart a job when a crash occurs. As a result, jobs that experience temporary issues, such as a network hiccup, are re-submitted and run again.

![Diagram of FME Server recovery process](image)
After FME Server submits a translation request to an FME Engine, it monitors the connection to that engine until a response is returned.

FME Server can resubmit a failed job if:

- The connection to the engine is lost.
- The engine crashes.

FME Server continues to re-submit a translation up to a specified number of attempts. To prevent FME Server from indefinitely retrying a job that fails, the default setting is to resubmit a failed job up to three times. This setting is configurable and can be turned off entirely.

---

**Ms Analyst says...**

**WARNING!** A failed translation request may cause an FME Engine to shut down improperly. If no maximum limit is imposed, the translation is resent indefinitely, which may cause repeated FME Engine failures. Re-submitted transactions may also cause data duplication, such as when writing to database formats or when writing mid-translation with the FeatureWriter.

---

**Failover**

The goal of a failover environment is to remove single points of failure so that a component can fail, but not take the entire system offline. FME Server supports two approaches to failover: **Active-Passive** and **Active-Active**.

We typically recommend the Active-Passive architecture, which meets the needs of most enterprises. There are advantages and disadvantages to both approaches.

Keep in mind that with failover, the FME Server Core, Jobs, and Engines are looked after for you, but the customer is in charge of making the Database and File System fault tolerant.

---

**Active-Passive**

With the Active-Passive approach, when the Active system fails, the Passive system takes over the capabilities of the failed Active system and assumes the role of the Active system. The failed system, in turn, assumes the Passive mode when it becomes healthy again. The failed system can then be investigated while the new Active system provides continued operation of FME Server. Once the new Passive system is recovered, it remains in this role until another failure on the Active system occurs.
Failover is achieved through a heartbeat monitor between the Active and Passive systems. The types of failures that typically cause failover are hardware and operating system crashes, in which the primary system goes down completely.

Keep in mind that after the Active Core fails, it takes 3-5 minutes for processing to resume on the Passive Core which has now become the new Active Core. Any schedules that would have triggered jobs during this window will not occur.

**Sister Intuitive says...**

*Clients of Notification Service publishers do not failover. These clients must be manually reconfigured to connect to the new active core, or, alternatively, restore to the original Active Core.*

The diagram below shows the structure of an FME Server system properly configured for Active-Passive failover:

In the Active-Passive architecture, the FME Server Web Application Server and FME Server System Share files are separated physically. The Database Server, File System, and Web Application Server should all be configured for fault tolerance. Fault tolerance for these components must be provided by the client or customer.
Active-Active

The Active-Active failover architecture duplicates complete FME Server installations on separate servers. In other words, all components reside on the same system, and additional systems are configured similarly and provide similar functionality. A third-party load balancer directs incoming traffic to one of the available systems. When requests are directed to any of the systems, they are handled independently and by only one system. This approach works well with a cloud-based computing environment, such as Amazon Web Services, in which machines can be cloned easily to expand capacity.

Differences Between Active-Active and Active-Passive

<table>
<thead>
<tr>
<th>Feature</th>
<th>Active-Active</th>
<th>Active-Passive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy setup using Express Installation option</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Publishing workspaces is a one-time task for the whole system</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Requires administration of multiple FME Servers</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Processing capacity is diminished when a system fails</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>May still require recovery/replication of the FME Server System Share for entire environment</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Schedules automatically failover</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
Planning for Disaster Recovery

Disaster recovery is primarily concerned with recovering FME Server operations and data in the event of a major failure of a data center. The time frame for disaster recovery is typically longer than failover recovery. Disaster recovery may range from minutes, hours, or even days, while failover recovery is typically expected in seconds or minutes.

Disaster recovery can be incorporated into any of the failover architectures. Alternatively, if you are primarily concerned with disaster recovery, and less concerned - or even not at all concerned - about the fast recovery provided by failover, you may want to implement a different architecture.

The general concept of disaster recovery is that if one data center fails, the second data center takes over, and the FME Server Core located there becomes the Active core.

This example of disaster recovery is an adaptation of an Active-Active architecture, but without the third-party load balancer between systems. Instead, FME Server clients must be manually redirected to the Core host server of the second data center in the event of a disaster. Each data center houses full (“Express”) installations of FME Server, essentially configured to provide similar functionality. To ensure synchronicity of the FME Server system data between data centers, Backup & Restore operations are performed regularly. (Otherwise, workspaces must be published twice - to the FME Server Core hosts on each data center).

Keep in mind that when planning for disaster recovery, all clients of FME Server, including web browsers, the FME Server Console, and the FME Server REST API, must connect to the Active FME Server Core host.
Security Updates

All installations of FME Server, regardless of type, include the FME Server Core and FME Engines. These components are always provided directly from the FME Server installation package. Two additional components - a Web Application Server and a server for the FME Server Database - must also be installed.

When you choose to install a full, stand-alone version of FME Server, the install package provides its own versions of these components, including an Apache Tomcat web application servlet, and a PostgreSQL database server. This is the “Express” installation option. If you choose a Distributed installation of FME Server, you can either provide your own web application server or choose the default FME Server Web Application Server, and, depending on the scenario (2-tier or 3-tier architecture), you may also provide a database server.

One factor in deciding between a stand-alone or distributed installation of FME Server is the degree of control you want in applying security updates to the web application and database servers. If you install a full, stand-alone FME Server, keep in mind that any security updates to these components are dependent on updates to FME Server releases in general. Each time FME Server releases an update to its software (including both major and minor releases), any security updates for these components are included in that release. You will need to re-install to receive these updates.

If you do not want to rely on updates to the FME Server software in general for security updates to the Web Application and Database servers, then we recommend a Distributed installation. In this case, you provide these additional server components on your own, and maintain security updates for them separately.

- In the case of the Web Application server, both Apache Tomcat and Oracle WebLogic are supported.
- The FME Server Database supports PostgreSQL, Oracle, and SQL Server.

Alternatively, if your FME Server is entirely internal to your organization, and behind a firewall, then you may be more comfortable with the security updates provided with a full installation.

---

Mr. E. Dict, (Attorney of FME Law) says...

Please be sure to review the FME Server Technical Specifications for the most up-to-date information on Web Application and Database Server compatibility.

---
Licensing

FME Server 2016 introduced a new licensing mechanism that no longer relies on third-party software to serve licenses. FME Engine licenses are now served directly through the FME Server Core and are saved to the FME Server System Share - this introduces a variety of benefits including easier management, especially when configuring a Distributed/Custom FME Server installation.

Request and Install a License

Online Mode

The fastest and easiest method for licensing FME Server is to use the online method. FME Server requires only basic user information (Name, Email) and the serial number provided by your account manager. Requests are sent over HTTP/HTTPS to retrieve the license file from our backend databases.

You can request a license in the Engines & Licensing tab of FME Server:

By default, license files are installed to C:\ProgramData\Safe Software\FME Server\licenses.

Chef Bimm says...

If you change the machine FME Server is installed to, you do not have to contact Safe Support or your account manager - simply request the license again after FME Server is installed to the new machine!

Offline Mode

If the machine hosting the installation of FME Server is disconnected from the internet, or if firewall rules prevent your machine from communicating with our backend database, then there is an offline method for retrieving your FME Server license file.

In the Request License form, select 'No' to instead have a JSON file downloaded to your local file system. This file can then be forwarded to codes@safe.com where an automatic process (running FME in the background) will return a valid license file to you after a few minutes.
Request A New License

Use automatic licensing via the internet?

- Yes  - No (manual - no internet or other connection issues)

This file can then be drag-and-dropped onto the Engines & Licensing page to license FME Server.

Extending an Evaluation License

If you requested a 7-day evaluation license, you should have an e-mail from codes@safe.com that allows you to extend the license to 60 days. Any user can request an FME Server evaluation license without the need for a serial number.
Chapter Review

This chapter introduced you to how to plan for and license an FME Server installation.

What You Should Have Learned from this Module

Theory

- FME Workspaces are a part of FME Desktop, not FME Server. If you do not have access to FME Desktop, you cannot publish workspaces to FME Server, although you can still perform and test the installation.
- FME Server has multiple installation types: **Express, Distributed/Custom, Engine, and Silent**.
- A Distributed installation can be 2- or 3-tiered depending on how you want to distribute the FME Server Web Services, FME Server Application, and the FME Server Database.
- FME Server provides fault tolerance through **Recovery** and **Failover**.
- Component Recovery is achieved through the FME Server Process Monitor - automatically restarting components that fail.
- Job Recovery is the ability to restart a job when a crash occurs.
- Configuring for Failover removes single points of failure so that a component can fail, but not take the entire system offline.
- The two types of failover are: **Active-Passive** and **Active-Active**.
- Disaster Recovery can be incorporated into any of the failover architectures.
- Security updates for a stand-alone FME Server are dependent on updates to FME Server releases.
- Distributed FME Server installations allow you to maintain the security updates for your provided server components (the Web Application Server and/or the Database Server).
- FME Server can be licensed using either Online or Offline methods.
FME Server Connectivity
Firewalls and Ports

Configuring Firewall Settings

The FME Server Web Services and other clients use the FME Server API to communicate with the FME Server Core over TCP/IP. Requests are sent to the FME Server Core over port 7071. Result messages are returned to clients over a randomly assigned port created by the FME Server Core. Therefore, be sure to configure any firewall settings on the <webHost> with a rule to allow for full communication with the <coreHost> machines.

When specific ports are desired, the port should be made available and not blocked by firewall settings.

Note: An Inbound Rule "Allow All" is created for <FMEServerInstall>\Server\fme.exe on Windows machines when FME Server is installed.

Ports
Ports 25, 7125, and 465 are for the SMTP Publisher.

Ports 7069 and 7082 are for FME Server Database communications.

Ports 7070 and 7501 manage FME Engine processes.

Port 7071 uses the REST API to send requests to the FME Server Core.

Ports 7072 - 7076 manage Notification Services.

Ports 7077 and 7081 are for Configuration, Backup & Restore requests, and System Cleanup tasks.

Port 7078 handles WebSocket Server requests.
**Port 7079** handles FME Server Resource requests.

**Port 7500** manages FME Server Core processes.

---

**Miss Vector says...**

*For an up-to-date and complete list of ports used by FME Server, and more detailed descriptions, please see FME Server Ports documentation.*
DNS

It is important to know the name of your host computer when using FME Server. During the installation, you will be prompted:

- To enter the hostname for connecting to FME Server (with Express installation),
- To specify the host that will run the FME Server Core (with Distributed installation), or
- To specify the name of the machine hosting the primary FME Server Core (with Engine installation).

It is important to make sure you have the correct hostname for proper control and management of FME Engines as changing this post-installation is currently only supported for the FME Server Web Services.

Police Chief Webb-Mapp says...

*Do not use “localhost” as your hostname if you want FME Server to be accessed remotely!*
CORS

Cross-Origin Resource Sharing (CORS) allows you to specify websites hosted on other domains that can access resources from the FME Server through Ajax requests.

CORS is enabled by default to allow any host to access FME Server resources.

To disable CORS:

1. Click Load Template, and select Disable CORS.
2. Click Save Changes. (Or to cancel, click Revert Changes).

To re-enable CORS:

1. Click Load Template, and select Allow All Hosts or Allow Specific Hosts.
2. Configure the remaining settings as desired.
3. Click Save Changes. (Or to cancel, click Revert Changes).

CORS Settings Options

*Allowed Origins*: A comma separated list of hosts that are allowed access to the FME Server. An * allows access from any host. An * cannot be specified if any origins are passing credentials. For an example of how to specify the list of hosts, click Load Template and select Allow Specific Hosts.

*Allowed Methods*: A comma separated list of HTTP methods that may be used in requests from the allowed origins.

*Allow Headers*: A comma separated list of permitted request headers from the allowed origins. A request header is any custom header set by the browser JavaScript application through method XMLHttpRequest.setRequestHeader().

*Exposed Headers*: A comma separated list of non-standard response headers that are safe to expose to the requestor (initiated through the XMLHttpRequest.getResponseHeader() method). This information is returned in the Access-Control-Expose-Headers response header.

*Pre-flight Max Age*: Specifies how long, in seconds, the results of a pre-flight request can be cached by the requestor. This information is returned in the Access-Control-Max-Age response header.

*Support Credentials*: If TRUE, allows the requestor to include credentials to authorize with the FME Server, including cookies, HTTP authentication (tokens), or client-side certificates. This value is returned in the Access-Control-Allow-Credentials response header.

---

**Miss Analyst says...**

*FME Server 2017 now has "Allow All Hosts" as the default setting for CORS.*
Chapter Review

This chapter introduced you to FME Server connectivity - Ports, DNS, and CORS settings.

What You Should Have Learned from this Module

Theory

- Firewall settings should not block FME Server ports.
- FME Server utilizes multiple ports with their own important functions.
- The correct hostname allows for proper control and management of FME Engines.
- Cross-Origin Resource Sharing (CORS) allows you to specify websites hosted on other domains that can access resources from FME Server.
- CORS is enabled to Allow All Hosts by default.

FME Skills

- How to disable and re-enable CORS.
FME Server Security
Role- and User-Based Access

FME Server security is based on two primary concepts:

- **Users**: Users are the individual accounts that access FME Server. When FME Server is installed for the first time, default user accounts are created.
- **Roles**: Roles are comprised of one or more users.

FME Server security controls access to resources either through role-based or user-based access.

### Role-Based Access

Roles make it easy to assign the same set of permissions to multiple users based on job function. Permissions to perform certain operations are assigned to specific roles. In turn, these permissions apply to the users who belong to that role.

For example, a request by user user1 could be to run a workspace in the Samples repository for the Data Download Service. FME Server security grants access if any of the roles to which user1 is assigned has permission to run workspaces in the Samples repository, and also has access to the Data Download Service.

A default set of roles is defined when FME Server is installed. These are:

- **fmesuperuser**: For users with unlimited access to the system, including Backup & Restore tasks.
- **fmeadmin**: For users who need to carry out specific administration tasks.
- **fmeauthor**: For users who are authoring workspaces to run on FME Server.
- **fmeuser**: For users who need to run (but not author) workspaces.
- **fmeguest**: For temporary users who need a minimal set of permissions.

### Police Chief Webb-Mapp says...

_I am the law! The FMESuperUser role is the high court of FME Server and is granted all permissions on all security settings. What’s more, these permissions cannot be revoked, unset, or appealed against! So, be sure not to assign accounts to the FMESuperUser role unless you really, really mean for them to be given that degree of power!_

A number of default accounts are created too. These are:

- **admin**: Assigned to the fmesuperuser and fmeadmin roles.
- **author**: Assigned to the fmeauthor role.
- **user**: Assigned to the fmeuser role.
- **guest**: Assigned to the fmeguest role.

### Chef Bimm says...

_Don’t forget, these are just default accounts that FME creates. You can create any role necessary for your system, assign any specific security settings to it, and create any number of users assigned to that role._
On the Roles page of the Web User Interface, an administrator can:

- Create and remove roles.
- Configure users in roles.
- Configure permissions of roles.

**User-Based Access**

Another way for FME Server to determine if a user can access a resource is whether the user owns it, or has been given permissions on it.

**User Ownership**

Anything a user creates in FME Server, such as a repository, is owned by that user. When you own something, you have full permissions on it. This permission supersedes the permissions you have on other items in FME Server based on the role to which you belong.

Additionally, as an owner, you can:

- Share permissions on the items you own with other users or roles.
- Assign ownership of something to another user.

**User Permission**

Users can be granted permissions on resources, and these permissions may superecede the permissions available to them through their role. (In fact, it is not even necessary for a user to belong to a role.)

On the Users page of the Web User Interface, an administrator can:

- Create and remove users.
- Configure users into roles.
- Configure permissions of users.

---

**Sister Intuitive says...**

*On the Active Directory page of the Web User Interface, an administrator can integrate the organization's Active Directory users and groups into its FME Server security configuration.*

---

**Miss Vector says...**

*If I want one user to have a higher level of access to other users in the same role (say I wish to let an FME author be able to manage engines) what must I do?*

1. Simply select that user from the user list and enable the manage Engines & Licensing policy
2. Promote that role to superuser status so that the user has a higher level of security
3. Create a new role with the manage Engines & Licensing policy enabled and move that user to it
4. Create a new role with the manage Engines & Licensing policy enabled and add that user to it as well as the original role*
Security Policies

There are various sections of security policies that can be set for each role or user. While there are permissions that can be set on each individual item in FME Server, the visibility of pages in the FME Server web interface are managed by the Access or Manage privileges.

Run Workspace

Run Workspace controls the ability to - you guessed it - run a workspace on FME Server. The Advanced option allows a user to access advanced job directives and the direct URL to run a workspace.

Jobs

Access to the Jobs page allows the user to view the jobs they have run, or cancel any of their jobs that are currently running or in the queue. The Manage option allows them to view the full Job history on FME Server and the ability to cancel any job, or remove any job from the history.

Schedules

Schedules are one of the core functions FME Server provides. Access to each schedule can be controlled.

Repositories

Repositories are a place to store and categorize workspaces. Each role or user can be given different permissions for each and every repository - download, read, publish, run, remove. Access permission is not necessary to run a workspace - only Run permission on the applicable repository is required.

Publications

Publications are a subset of the FME Server Notification System. Different permissions - read, write (edit), remove - can be assigned for each publication.

Subscriptions

Subscriptions are a subset of the FME Server Notification System. Different permissions - read, write (edit), remove - can be assigned for each subscription.

Topics

Topics are related to Notifications (Publications and Subscription). Different capabilities – read, write, publish, remove – can be assigned for each topic created.

Resources

Resources are files and datasets stored on FME Server. Different permissions – access, list, write, upload, remove – can be assigned to each resource.

Connections
Connections are predefined logins to either web services or databases. Each role or user can be given permission to access different connections stored in FME Server, to create new definitions, and to manage in the FME Server web interface.

Projects

Projects are created to manage a subset of FME Server resources, for example - workspace, schedules, publications, and subscriptions. Different permissions - read, write, delete - can be assigned for each project.

Dashboards

Dashboards offer an easy way to view FME Server health using the FME Server web interface.

Engines & Licensing

The Engines & Licensing page concerns licensing FME Server, managing the number of active FME Server Engines, and the number of connected hosts.

Security

Granting the permission for Security allows the role or user to create, enable, disable, and remove users and roles, as well as configuring for Active Directory.

System Cleanup

System Cleanup tasks are defined in the FME Server web interface and help to manage temporary files and log files among other items.

Services

Services are key items of functionality on FME Server. They are the different methods by which a workspace can be run and output data delivered. Each role or user can be allowed – or not – to use a particular service.
Exercise 1: Creating A New User

<table>
<thead>
<tr>
<th>Data</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overall Goal</strong></td>
<td>Create a new user with limited privileges in the FME Server web interface</td>
</tr>
<tr>
<td><strong>Demonstrates</strong></td>
<td>Setting security options in FME Server</td>
</tr>
</tbody>
</table>

Your company has recently hired a new analyst who will be accessing FME Server. The new employee doesn't quite fit into the current FME Server Roles you have in place so you need to create a new role for them.

1) **Connect to FME Server**
Open the FME Server web interface, either through the Web Interface option on the Windows Start Menu or directly in your web browser (http://localhost/fmeserver), and log in using the username and password admin.

Select the Security page, under the Admin heading on the left sidebar, to see a list of your current users.

2) **Create a New User**
Let's create a new FME Server user account for the new analyst. Click New to add a new user:

When prompted, create a new user with the following parameters:

- **User Name:** NewUser
- **Full Name:** NewUser
- **Password:** NewUser1

3) **Configure Permissions**
Now that we have the credentials for our new user account specified, let's set the permissions for what features and items in FME Server they have access to.

By selecting the Load Template button, you have the option to copy permissions from an existing role.

Select fmeguest from the Load Template options. This can help speed up security configurations. Notice that Run Workspace and Jobs have been now granted Access.

Configure permissions to match the following:

- **Run Workspace:** Access
- **Jobs**: Access
- **Schedules**: Create
- **Repositories**: Create
- **Projects**: Create

Notice how by selecting Create, the Access privilege is automatically granted.

Select **OK** at the bottom to create the user.

**4) Test the New User Account**

It's important to verify the options we set have been honored.

Either logout of the admin account or open a new private browsing window, and login using the credentials for the new user account we just created.

Notice how this user only sees a limited set of menu options: Run Workspace, Jobs, Schedules, Repositories, and Projects.

---

**CONGRATULATIONS**

*By completing this exercise you have learned how to:*
- Create a new user on an FME Server installation
- Set permissions from an existing FME Server role
- Test a newly created account to ensure it works correctly
Running Services without Authentication

A special account, referred to as the trusted user account, can be used to provide unauthenticated access to any component of FME Server. By default, this trusted account is named guest and is assigned to the fmeguest role. By default, the fmeguest role is configured to allow unauthenticated access to the FME Server Web Services. This means it is possible to invoke a service URL without providing any credentials.

Police Chief Webb-Mapp says...

If you want all of the FME Server Web Services to prompt for authentication, remove the guest account after you configure your own set of users and access control for your server.

The trusted user account is configured in the propertiesFile.properties file for each web service. If your FME Server installation uses the built-in Apache Tomcat servlet, these files are located under:

C:\Program Files\FMEServer\Utilities\tomcat\webapps\<service>\WEB-INF\conf\propertiesFile.properties

To change the user name and password of the trusted account for a service, configure the DEFAULT_USER_ID and DEFAULT_PASSWORD parameters:

#DEFAULT_USER_ID - The default user ID to log in FME Server
DEFAULT_USER_ID=guest

#DEFAULT_PASSWORD - The default password for default user ID
DEFAULT_PASSWORD=guest
Running FME System Services under Different Accounts (Windows)

By default, the FME Server Core, FME Server Engines, and FME Server Application Server Windows Services run under the "Local System" account, which may not have network permissions. You may need to run these services under different accounts that can read and write data to the FME Server System Share, particularly in a distributed installation where these services are installed on separate machines.

For instructions on how to run the FME Server System Services under a different account, please see current documentation.
Active Directory and FME Server

FME Server allows you to connect to an existing Active Directory / LDAP server and incorporate available users and groups into your FME Server security configuration.

Once a connection is created, you can specify which user(s) and role(s) will be imported into FME Server - noting that their passwords and membership will continue to be managed by the Active Directory server itself. The existing users and roles on FME Server can coexist with those imported. FME Server roles can contain both System (FME Server) and Active Directory users.

Any number of Active Directory connections can be managed by FME Server - this means that you are able to connect to multiple domains.

First-Officer Transformer says...

While you can import Active Directory Roles, you cannot modify membership in FME Server. FME Server only has read permission on any connected Active Directory listing.

Integrated Windows Authentication

With Integrated Windows Authentication, also known as "single sign-on", you can enable the users you import from your Active Directory connections to integrate their Windows login credentials with FME Server. When single sign-on is enabled:

- There is no need to log in to the FME Server web interface. Instead, select Use Windows Credentials on the Sign In page.
- Similarly, there is no need to log in to FME Server when using FME Workbench to publish a workspace. Instead, simply check Use Windows session credentials in the Publish to FME Server wizard.

Note: When publishing a workspace to a Notification Service, you must still provide your FME Server credentials in the HTTP Authentication fields of the Edit Service Properties dialog of the wizard.

To enable single sign-on

1. Update the Windows domain configuration to allow FME Server to authenticate using single sign-on.
2. Update the web browser configuration to use single sign-on.
Exercise 2: Configuring Active Directory/LDAP

<table>
<thead>
<tr>
<th>Data</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Goal</td>
<td>Connect FME Server to an existing Active Directory service</td>
</tr>
<tr>
<td>Demonstrates</td>
<td>Configuring Active Directory in FME Server, Importing Users and Groups</td>
</tr>
</tbody>
</table>

While FME Server provides a means to control access to its components and items within by creating Users and Roles, your company has instructed you to connect FME Server to an existing Active Directory service. After this connection is completed, you will import existing users and groups and configure permissions.

Sister Intuitive says...

Due to security requirements and restrictions it may not be possible to complete this exercise. Instead, please watch this video demonstrating the exercise.

1) Connect to FME Server

Open the FME Server web interface, either through the web interface option on the Windows Start Menu or directly in your web browser (http://localhost/fmeserver), and log in using the username and password admin.

Click Security, under the Admin heading on the left sidebar, and then select Active Directory.

2) Create Connection to Active Directory

By creating a new connection, you can incorporate your organization’s Active Directory users and groups into your FME Server security configuration.

To get started, select New to open the Create New Server Connection page.

Enter the following information:

- **Name**: FME Active Directory
- **Host**: dc.fme.com
- **Port**: 389
- **Domain Search User**: DC:Administrator
- **Domain Search Password**: dcAdmin2017

Click OK to save the new Active Directory connection. You will be returned to the Active Directory page. Wait for the Status to change from Yellow to Green, indicating that the connection is successful.

3) Import Users

Now that the connection is established, select the Import Users icon to add users from the Active Directory connection.

On the Browse Users page, type in mvector and press Enter. Select Miss Vector's user and click Import.

A notification will appear in the top right of the web browser window to indicate that the user was successfully imported.

Note: If Miss Vector belonged to any Active Directory groups, we could have instead imported that as an FME Server Role – and all users that are a member of would be imported automatically.
4) Configure User Permissions
After the Active Directory user is imported to FME Server, you must configure the permissions.

Select Security > Users under the Admin heading on the left sidebar of the FME Server web interface. Click on the Miss Vector user that was just created to open the Edit User page.

Click in the text box area for Assigned Security Roles and select fmeauthor. Notice all the inherited permissions from the fmeauthor Role that are now selected.

Select OK at the bottom to apply the changes.

5) Test the New User Account
Test that the import and assigning permissions was successful by logging into FME Server as Miss Vector.

Either logout of the admin account or open a new private browsing window, and login using the credentials below:

- Username: mvector
- Password: dcFME2017

CONGRATULATIONS!

By completing this exercise you have learned how to:
- Connect FME Server to an existing Active Directory configuration
- Import Users and Groups from Active Directory
HTTPS/SSL and FME Server

HTTPS ensures that communication between the client and server is encrypted, so that if it is intercepted, the third party cannot easily view or use the information. For FME Server, you can use HTTPS to ensure that sensitive login information is not exposed.

When configuring FME Server for HTTPS, both Certification Authority (CA)-issued and self-signed certificates are supported.
Exercise 3
Configuring FME Server for HTTPS

<table>
<thead>
<tr>
<th>Exercise 3</th>
<th>Configuring FME Server for HTTPS</th>
</tr>
</thead>
</table>
| **Data**   | C:\FMEData2017\Resources\ServerAdmin\server.xml  
C:\FMEData2017\Resources\ServerAdmin\web.xml  
C:\FMEData2017\Resources\ServerAdmin\context.xml |
| **Overall Goal** | Change access to the FME Server web interface to HTTPS |
| **Demonstrates** | Creating a self-signed certificate and importing into the FME Server keystore |

Your company is rapidly expanding and hiring many new employees. Now, instead of having everyone able to access to FME Server, you have set up logins so only trusted personnel have access. You also want to set up extra precautions to keep the transferred information secure.

HTTPS ensures that communication between the client and the server is encrypted, so that if it is intercepted, the third party cannot easily view or use the information. For FME Server, you can use HTTPS to ensure that sensitive login information is not exposed.

For any HTTPS (SSL) page, a certificate is required. For development and testing purposes, self-signed certificates are supported. For production use, we recommend that you use SSL certificates from a verified SSL certificate authority (CA).

1) Create a Keystore File
First, you must generate a keystore that contains a certificate chain using the Java Keytool from the Java Developer Kit (JDK).

Open a **Command Prompt** as an administrator.

Navigate to the FME Server Java bin directory:

```plaintext
cd C:\apps\FMEServer\Utilities\jre\bin\n
```

Run the following command to create a new keystore file:

```plaintext
keytool -genkey -alias tomcat -keyalg RSA -keystore tomcat.keystore
```

Set the following values when prompted:

- **Keystore Password**: tomcat
- **First and Last Name**: localhost
- **<Remaining Parameters>**: <leave_blank>

Enter yes when prompted if the input is correct. When prompted for the key password for <tomcat>, press RETURN.

A new keystore is created in `C:\apps\FMEServer\Utilities\jre\bin\`

Copy the new keystore file to the tomcat directory in the FME Server installation:

```plaintext
copy tomcat.keystore C:\apps\FMEServer\Utilities\tomcat\tomcat.keystore
```
2) Working with the Certificate
The new keystore must be imported into the FME Server keystore for trusted certificates. In the command prompt, enter the following command:

```
keytool -importkeystore -srckeystore tomcat.keystore -destkeystore C:\apps\FMEServer\Utilities\jre\lib\security\cacerts
```

You will be prompted to enter two passwords. One for the destination keystore and one for the source keystore. The password for the destination keystore is **changeit**. The password for the source keystore is **tomcat**.

---

Configuring Tomcat
In the next steps, we need to modify three configuration files of Apache Tomcat. All three files are located in the FME Server installation directory: `C:\apps\FMEServer\Utilities\tomcat\conf`.

It is a good idea to make copies of any files you will be changing and place them in a separate directory until you have verified that the edits are working successfully.

3) Configure server.xml
Open `C:\apps\FMEServer\Utilities\tomcat\conf\server.xml` file in a text editor in administrator mode.

Locate the `SSLEngine` setting in the `<Listener>` element, including `className="org.apache.catalina.core.AprLifecycleListener` and change the “on” value to “off”.

Exercise 3: Configuring for HTTPS
Locate the `<Connector>` element that contains `protocol="org.apache.coyote.http11.Http11NioProtocol"` and replace it with the following:

```
    port="8443" minSpareThreads="5"
    enableLookups="true" disableUploadTimeout="true"
    acceptCount="100" maxThreads="200"
    scheme="https" secure="true" SSLEnabled="true"
    keystoreFile="C:\apps\FMEServer\Utilities\tomcat\tomcat.keystore"
    keystorePass="tomcat"
    clientAuth="false" sslEnabledProtocols="TLSv1,TLSv1.1,TLSv1.2"
    cipherSuites="TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256,TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA,"
    TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384,TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA,
    TLS_RSA_WITH_AES_128_CBC_SHA256,TLS_RSA_WITH_AES_128_CBC_SHA,
    TLS_RSA_WITH_AES_256_CBC_SHA256,TLS_RSA_WITH_AES_256_CBC_SHA,
    TLS_RSA_WITH_AES_128_CBC_SHA,TLS_RSA_WITH_AES_256_CBC_SHA,
    SSL_RSA_WITH_3DES_EDE_CBC_SHA"
    URIEncoding="UTF8" />
```

Save and close the `server.xml` file.

**4) Configure web.xml**

Open the `web.xml` file in a text editor in administrator mode.

Add the following code block to the end of the file, just before the closing `</web-app>` element:

```
<security-constraint>
    <web-resource-collection>
        <web-resource-name>HTTPSOnly</web-resource-name>
        <url-pattern>/</url-pattern>
    </web-resource-collection>
    <user-data-constraint>
        <transport-guarantee>CONFIDENTIAL</transport-guarantee>
    </user-data-constraint>
</security-constraint>
```

Save and close the `web.xml` file.

**5) Configure context.xml**

Open the `context.xml` file in a text editor in administrator mode.

Add the following to the end of the file, just before the closing `</context>` element:

```
<Valve className="org.apache.catalina.authenticator.SSLAuthenticator" disableProxyCaching="false" />
```

Save and close the `context.xml` file.

**6) Verify the Configuration**

Now that we have made our changes, we want to verify that HTTPS was configured correctly for FME Server.
Exercise 3: Configuring for HTTPS

Restart the FME Server Application service from the Start menu > FME Server 2017.1 > Restart FME Server.

Open a browser and navigate to https://localhost:8443/fmeserver.

You should see the FME Server login page in a secured format.

Note: If a self-signed certificate is used for testing, your browser may report the page as not secure:

![Image of browser showing the FME Server login page with a security warning]

For self-signed certificates, some browsers will allow you to add an exception for https://localhost:8443/.

7) Modify Service URLs to Use HTTPS
To enable SSL for FME Server Services, login to the FME Server web interface (username and password admin), and select Services on the left sidebar.

On the Services page, you can update specific services or all services at once. Let's update all services. Click Change All Hosts
The Change All Hosts dialog opens. Make sure Host is set to https://localhost:8443 and click OK.

The URLs will be updated to their new, correct values on the Services page.

CONGRATULATIONS!

By completing this exercise you have learned how to:

- Create a self-signed certificate
- Import a certificate in the FME Server Java keystore
- Change FME Server Web Services to use HTTPS URLs
Chapter Review

This chapter introduced you to FME Server security.

What You Should Have Learned from this Module

Theory

- **Users** are the individual accounts that access FME Server.
- **Roles** are comprised of one or more users.
- Default roles and accounts are created when FME Server is installed, but you can also add your own.
- You can integrate your organization’s Active Directory users and groups into FME Server.
- The **Trusted User Account** provides unauthenticated access to any component of FME Server.
- FME Server Windows Services can be changed to any **Service Account** to allow network access.
- FME Server can be configured for HTTPS, supporting both CA-issued and self-signed certificates.

FME Skills

- The ability to create a new user and assign permissions.
- The ability to create a connection to an Active Directory server and import users and roles.
- The ability to encrypt the communication between the client and server machines with HTTPS.
Questions and Answers

Here are the answers to the questions in this chapter.

Miss Vector says...

If I want one user to have a higher level of access to other users in the same role (say I wish to let an FME author be able to manage engines) what should I do?

1. Simply select that user from the user list and enable the manage Engines & Licensing policy
2. Promote that role to superuser status so that the user has a higher level of security
3. Create a new role with the manage Engines & Licensing policy enabled and move that user to it
4. Create a new role with the manage Engines & Licensing policy enabled and add that user to it as well as the original role

Security policies can be set at both the user and role levels. While you can create a new role and assign the user to it (Option 4) – enabling the user to be a member of two roles – it is much easier to simply edit the permissions of the individual user (Option 1).
Migration and Upgrades
Backup and Migration

To migrate the configuration of an FME Server instance to another instance, perform a backup and restore operation using the tools on the Backup & Restore page of the FME Server web interface.

Make sure to manually back up the FME Server configuration files to a location outside of your FME Server installation directory in case you need to refer to them later. These configurations are not included in the primary backup procedure.

Which FME Server Configuration Components are Migrated?

The following components of your FME Server are migrated:

- Repositories and the items stored in them, including workspaces, custom transformers, custom formats, templates, and resources. Any designations by users of a repository item as a ‘favorite’ are also migrated.
- FME Server Services.
- Notifications components, including Topics, Subscriptions, and Publications.
- Security configuration, including Users, Roles, and tokens.
- Schedules.
- Resources, which include the following:
  - Resources whose definitions and files are both stored within FME Server, and are configured for migration. By default, the DATA, ENGINE, and DASHBOARD Resources are configured for migration. To determine if default resource folders are migrated, open the FME Server configuration file located at C:\Program Files\FMEServer\Server\fmeServerConfig.txt. Resources with a SHAREDRESOURCE_ISMIGRATABLE_* value of TRUE are migrated.
  - Online resources whose definitions are stored within FME Server, but whose files are stored outside FME Server. In the current version of FME Server, these resources are limited to any Amazon Web Service (AWS) S3 bucket connections and Network-based resources – for example, directories accessed via UNC. Only connection definitions are migrated (such as bucket names and authentication parameters). The files contained within these resources are not stored on FME Server.
  - Database Connections and Web Connections.

Notably the job logs cannot be migrated and must be manually backed up. The default location is C:\ProgramData\Safe Software\FME Server\resources\logs.

Sister Intuitive says...

Resource folders containing large amounts of data require considerable time to back up, and result in large configuration files. It is recommended that you define large folders as non-migratable. Following backup and restore, manually migrate these folders to the new FME Server. Alternatively, host big data on a UNC path, then point the new FME Server to that path.

Performing a Scheduled Backup of an FME Server Configuration

A workspace is provided with FME Server that can be scheduled to perform a backup of the FME Server configuration to an FME Feature Store (FFS) file. The configuration backup includes repositories, services, notifications, security settings and schedules.
Miss Vector says...

*How often can you schedule a backup of your FME Server configuration to occur?*

1. Once a year.
2. Once a month.
3. Once a week.
4. Once a day.
5. Once an hour.
Backup Configuration Files

Before proceeding with the primary task of backing up your FME Server configuration, we recommend manually backing up the FME Server Configuration Files to a location outside of your FME Server installation directory, in case you need to refer to them later. These files contain configurations for the FME Server Database, HTTPS, and miscellaneous settings for the Transformation and Repository Managers. These configurations are not included in the primary backup procedure. To restore any changes that were made in these files, you must be able to refer to them when the upgrade is complete, so that you can make the corresponding changes in the replacement file.

IMPORTANT: When restoring FME Server configuration files, do not replace or overwrite the files in the new installation. The structure of the configuration files may change between releases, so it is best practice to go through the old configuration file and the new configuration file together and update configurations in the new file as you come across them. The configuration files support line commenting for tracking specific changes.

Configuration Files

- `<FMEServerDir>\Server\processMonitorConfigCore.txt` - For starting and configuring FME Server Core processes.
- `<FMEServerDir>\Server\processMonitorConfigEngines.txt` - Sets the initial default FME Engines to start, manages engine upgrades, and port numbers for Engine Management requests.
- `<FMEServerDir>\Server\fmeServerConfig.txt` - Configures the FME Server transformation, manager, repositories, shared resources, scheduler, notifications, logs, failover clustering, and others.
- `<FMEServerDir>\Server\fmeCommonConfig.txt` - Configures the FME Server security and the database used by FME Server.
- `<FMEServerDir>\Server\fmeWebSocketConfig.txt` - Configures the FME Server WebSocket server.
- `<FMEServerDir>\Server\fmeEngineConfig.txt` - Configures the FME Engines, including subsections, pre and post commands, and success and failure responses.
- `<FMEServerDir>\Server\config\<subscribers_or_publishers>\websocket.properties` - Configures the FME Server WebSocket server.
- `<WebAppDir>\<fmeServiceName>\WEB-INF\conf\propertiesFile.properties` - Configures properties for FME Server Web Services. Use this file to set the host for the service and various settings.
- `<FMEServerDir>\Utilities\pgsql\data\pg_hba.conf` - Opens the database connections for express install.
- `<FMEServerDir>\Utilities\tomcat\conf\server.xml` - Configures web application server port, and connector protocols.
- `<FMEServerDir>\Utilities\tomcat\conf\web.xml` - Configures international encodings.
- `<FMEServerDir>\Utilities\tomcat\conf\context.xml` - Configures FME Server web application.
Exercise 1  |  Backup and Migration
---|---
Data | N/A
Overall Goal | Perform Backup and Restore operations for an FME Server installation
Demonstrates | Backing up and restoring automatic and manual FME Server configurations

Your organization has decided to upgrade FME Server to the latest version just released. You want to make sure all the configurations, settings, and resources you have made to your current FME Server will be transferred over to the new FME Server installation. By backing up your current FME Server and then migrating the configurations and settings to the new version you will save lots of time!

Miss Vector says...
If you have completed the Configure for HTTPS exercise, remember that the URL to connect to FME Server is now https://localhost:8443/fmeserver and NOT http://localhost/fmeserver!

1) Connect to FME Server
Open the FME Server web interface, either through the Web Interface option on the Windows Start Menu or directly in your web browser, and log in using the username and password admin.

2) Backup FME Server
When migrating FME Server, you need to back up your current FME Server configurations.

On the left sidebar, click Backup & Restore.

On the Backup page, make sure the default parameter is set:

- **Backup To:** Download

Click the Download button to start the FME Server backup process and save the file to your computer.

3) Backup Configuration Files
It is also a best practice to manually back up any FME Server configuration files you have altered to a safe location outside of the
FME Server installation directory. Certain configurations are not included in the primary backup procedure and you may want to reference the changes made to these files.

In this training course, if you have completed all exercises up until this point, we have modified server.xml, web.xml, context.xml, cacerts, and created a tomcat.keystore file in the Configuring FME Server for HTTPS exercise.

So if we were trying to migrate our current FME Server configurations, these are the files that we would want to have copies of for reference later on when restoring FME Server configurations.

Save these files with your backup configuration file to easily find during a restore.

4) Backup Log Files
Like configuration files, FME Server Log Files are not automatically backed up.

FME Server log files can be found on the Resources page of the web interface in the Logs folder.

For this exercise, we will backup only a couple of the log files. Go to Resources > Logs > core > current and place a checkmark in the boxes beside fmeconfiguration.log, fmeconnection.log, and fmeprocessmonitorcore.log.

Click Download and save these log files in the same location where you saved your BackupFMEServer configuration and your configuration files.

Log files from FME Server can be backed up but cannot be restored to a new instance of FME Server. However, it is still a good idea to backup log files in case you need to reference them later on. If you do not backup your log files, they will disappear when you uninstall FME Server.

Dr. Workbench says...

If you want to backup the entire logs folder, you can find it on your file system inside the resources folder of the FME Server System Share.
5) Verify Backup, Install FME Server, Restore Configurations

At this point, during a regular migration workflow, this is when you verify the backup and install your new FME Server. For the purposes of this exercise, we will end the exercise here.

It is vitally important that you verify the FME Server backup first, by installing a new instance of FME Server, before you uninstall FME Server. Once you uninstall there isn't an easy way to backtrack unless you regularly perform backups of your entire file system.

When restoring the configuration files that are manually backed up, it is strongly suggested to go through each configuration file instead of simply copying the old configuration file into the new FME Server directory - file structures and parameters may have changed between releases!

CONGRATULATIONS!

By completing this exercise you have learned how to:

- Backup your FME Server instance
- Backup additional Configuration Files
- Backup Log Files
Upgrading FME Server

Full FME Server Upgrade

There are multiple approaches to upgrading your FME Server installation, each with its own advantages and disadvantages. The following table outlines several factors for upgrading to a second machine with a different host name, upgrading to a second machine and using the same host name, and upgrading FME Server in-place, on the same machine.

<table>
<thead>
<tr>
<th></th>
<th>Upgrading to a Second Machine, Using a Different Host Name</th>
<th>Upgrading to a Second Machine, Using the Same Host Name</th>
<th>Upgrading In-Place, on the Same Machine</th>
</tr>
</thead>
<tbody>
<tr>
<td>FME Server configuration remains available from the old installation</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Existing FME Server installation remains accessible without interruption</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>No DNS entry modification is required by your IT department</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Does not require provision of additional machine</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Users and applications must be updated to access FME Server through a different host name</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FME Engine Only Upgrade

FME Engines are the component of FME Server that perform the actual data translations and transformations. At times, you might want to upgrade only your FME Engines and not any other FME Server components. For example, you might want to provide support for recently added formats or other newer functionality included in a new release, which requires only an upgrade of the FME Engines.

Safe supports installing newer FME Engines, as long as the engines share the same major version/year as the current installation of FME Server. For example, on FME Server 2016.0, the FME Engines may be upgraded to 2016.1.3, but may not be upgraded to 2017.0
**Projects**

Use the Projects page to bring together FME Server items into groups that share a common solution, or 'project', in your organization. By grouping items in projects, you can reference them in one easy place. You can also backup projects and restore them to another instance of FME Server.

**What Can a Project Hold?**

A project can include just about any FME Server object you create or upload, including:

- Workspaces, custom formats, custom transformers, and templates
- Repositories
- Schedules
- Topics, subscriptions, and publications
- Resources
- Resource Connections (currently includes any connections to Amazon Web Services (AWS) S3 buckets that appear on the Resources page)
- Cleanup Tasks
- Database connections and web connections
- Users
- Other projects

---

**Miss Vector says...**

*To add users to a project, you must belong to which role?*

1. fmesuperuser.
2. fmguest.
3. fmeauthor.
4. fmeuser.
5. Any user can add other users to a project.

---

**Backup and Restore a Project**

You can backup the contents of a project, and restore the project to the same instance, or another instance, of FME Server. For example, you can migrate a project when you are ready to use it on a production server after you have developed and tested its contents on a separate system.

**Migrating Projects for Other Users (fmesuperuser only)**

When you include users in a project, you can backup and restore a project for those users to work with on another system. Any permissions a user has on the current system are granted on the system to which the project is restored, if both of the following conditions are true:

- The permission is on an item in the project.
- The permission was granted to the user directly, rather than through membership in a role.

Any other permissions a user has on the current system do not carry over.
Viewing and Editing Projects

To view or edit a project, click on it to open the Edit page. Or, select the project and click Edit. You can:

- Edit the project name and description.
- Add and remove items.
- Get information about items: Select an item under Contents and click the information icon to the far right for item details.
Chapter Review

This chapter introduced you to migration and upgrades for FME Server, including FME Server Projects.

What You Should Have Learned from this Module

Theory

- Configuration files need to be manually backed up for reference when restoring any changes made to those files for the new FME Server.
- You are able to backup your repositories, notifications, schedules, security, and services with FME Server.
- You can backup a FME Server configuration to either a resource location or to your local system.
- FME Server can be scheduled for backups.
- FME Server provides a workspace that can be scheduled to perform a backup of the Server configuration to an FME Server Configuration File (*.fsconfig). The configuration backup includes repositories, services, notifications, security settings, and schedules.
- You can upgrade FME Server to a second machine, using a different host name or by using the same host name, or by upgrading in-place, on the same machine.
- It is possible to upgrade only the FME Engines for additional functionality of FME Server.
- FME Server Projects are great for bringing together several FME Server items into groups that are part of a common solution, for easy reference.

FME Skills

- The ability to backup your FME Server instance.
- The ability to backup your FME Server configuration files.
- The ability to backup FME Server log files.
- The ability to restore FME Server configurations.
Questions and Answers

Here are the answers to the questions in this chapter.

Miss Vector says...

*How often can you schedule a backup of your FME Server configuration to occur?*

1. Once a year.
2. Once a month.
3. Once a week.
4. Once a day.
5. Once an hour.

You can schedule a backup of your FME Server configuration by the second, by the year, and everything in between. Schedule a backup for the time range that works best for you and your organization.

Miss Vector says...

*To add users to a project, you must belong to which role?*

1. fmesuperuser.
2. fmeadmin.
3. fmeauthor.
4. fmeuser.
5. Any user can add other users to a project.

To add users to a project you must belong to the fmesuperuser role.
Scalability and Performance
Job Queues

Job queues are a mechanism for sending specific jobs to specific FME Engines. The reasons for using job queues include:

- Sending jobs to an FME Engine in close proximity to a data source.
- Sending jobs to an FME Engine that supports a particular format.
- Reserving an FME Engine for a scheduled task.
- Reserving an FME Engine for quick jobs.

When you create a job queue, you assign one or more FME Engines to the queue. Then, when you run a job, you can specify which queue to handle the job – this ensures that only the specified FME Engines will process that job.

By extension, you can also assign a repository to a queue. By default, all jobs are assigned to the queue of their respective workspace repository, unless another queue is specified for the job.

All engines and repositories must be assigned to a queue. If an engine or repository is not assigned to a queue explicitly, it is assigned to the Default queue.

FireFighter Mapp says...

"Job Queues" used to be referred to as "Job Routing" in older versions of FME Server.
In older versions, job tags were created in either configuration files or via the FME Server REST API.
Exercise 1: Job Queues

<table>
<thead>
<tr>
<th>Data</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Goal</td>
<td>Send a job through a specific FME Engine</td>
</tr>
<tr>
<td>Demonstrates</td>
<td>Creating a job queue and assigning jobs to queues</td>
</tr>
<tr>
<td>Start Workspace</td>
<td>None</td>
</tr>
<tr>
<td>End Workspace</td>
<td>C:\FMEData2017\Workspaces\ServerAdmin\JobQueues-Ex1-Complete.fmw</td>
</tr>
</tbody>
</table>

Your GIS department is all onboard with FME Server and translating jobs with the web interface, but jobs are always being queued, even the quick translations. You are wondering if there is a way to set aside one of the FME Server Engines for quick translations only so that you and your fellow technical analysts do not have to wait too long for your smaller jobs to complete. With job queues you can allocate specific engines to specific tasks.

Miss Vector says...

*If you have completed the Configure for HTTPS exercise, remember that the URL to connect to FME Server is now https://localhost:8443/fmeserver and NOT http://localhost/fmeserver!*

1) Create a Job Queue
Job queues are created in the FME Server web interface.

Login to the FME Server web interface and select *Admin > Engines & Licensing* in the left sidebar.

Scroll down to the *Job Queues* heading and select *Create Job Queue*.

Give it the name *Quick Translations* and click OK.

2) Assign FME Engines
Now that the job queue has been created, specific FME Engines – and repositories – can be assigned to the queue.

Click on the *edit button*. Select *localhost_Engine1* from the drop-down selection for Engines.
To save your edits click the edit button again.

3) Create FME Workspace
To confirm that the job queue is operating correctly, we can run a workspace in FME Server that specifies the Quick Translations queue. For this exercise we do not need a complicated workspace, just a job that will run.

Open FME Workbench and create a new Blank Workspace.

Add a **Creator** transformer and connect it to a **Logger** transformer.

4) Publish to FME Server
Publish the workspace to FME Server by selecting **Publish to FME Server** from the File menu in FME Workbench:

When prompted in the Publish to FME Server Wizard, publish the workspace to:

- **Repository Name**: Training
- **Workspace Name**: JobQueue_TestJob.fmw
- **Service**: Job Submitter

5) Connect to FME Server
Open the FME Server web interface, either through the Web Interface shortcut in the Windows Start Menu or directly in your web browser.

6) Assign and Run Workspace in Job Queue
Once you have a published to FME Server, you can run the **JobQueue_TestJob** workspace and set the Job Queue parameter.

Select **Run Workspace** in the left sidebar of the FME Server web interface.

On Run Workspace page, fill out the parameters as follows:
- **Repository**: Training
- **Workspace**: JobQueue_TestJob

Next, expand the **Advanced** options on the Run Workspace page. Set the **Job Queues** parameter to **QuickTranslations** (the name of the queue created in Step 1):

Click **Run** at the bottom of the Run Workspace page.

7) **Verify Job Queue Configuration**
You want to make sure that the job was routed to the correct engine and not just the first available engine.

In the left sidebar of the FME Server web interface select **Jobs > Completed**.

Select the workspace that just ran to open the **Job Details** page.

Click to expand the **Request Data** section. Next to the **queue** parameter you will see the name of the specified job queue:
Go back to Jobs > Completed to verify that the job was sent to the correct engine. When testing, you may consider submitting the job multiple times for an added verification step, and peace of mind, but this isn't necessary of course!

CONGRATULATIONS!

By completing this exercise you have learned how to:

- Create a Job Queue
- Successfully route a job through a specific engine
Adding FME Engines on a Separate Machine

You can add processing capacity to your FME Server by installing additional FME Engines on a separate computer from the FME Server Core.

The number of licensed FME Engines you can add is limited only by the host’s CPU and memory resources, which constrain the maximum concurrent request throughput.

The additional FME Engines can be of any architecture (32- or 64-bit) and installed to any supported operating system (Windows or Linux) - they do not have to match the specifications of the FME Server Core. It is important to note that the major versions must match - you should not install FME Server 2017 and try to add engines from FME Server 2016.
Changing Database Provider for FME Server Database

FME Server comes equipped with a PostgreSQL Database completely configured and ready for use. However, you may want to leverage a system that is already established, or is restricted by your company policies.

If you want to change the database provider for your FME Server database, and you have already installed FME Server - for example, an "Express" installation - you can do this by performing an "in-place" backup and restore procedure:

1. Backup your FME Server configuration.
2. Configure the new database server.
3. Update the database connection settings in an FME Server configuration file.
4. Restart FME Server.
5. Restore your FME Server configuration.
6. Remove dependency, disable, and stop the previous database service.

FME Server supports PostgreSQL, Microsoft SQL Server, or Oracle databases.

Mr. Flibble says...

*Even if you plan on changing the FME Server database provider, it is recommended to install with the default PostgreSQL database - this allows you to verify if the FME Server installation is successful.*
Exercise 2: Changing the FME Server Database Provider

<table>
<thead>
<tr>
<th>Data</th>
<th>C:\FMEData2017\Resources\ServerAdmin\pg_hba.conf</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Goal</td>
<td>Change the database provider for FME Server</td>
</tr>
<tr>
<td>Demonstrates</td>
<td>Configuring a new PostgreSQL database</td>
</tr>
</tbody>
</table>

Your company has an Express Installation of FME Server already installed but your Database Administrator has just informed you that you that the company will be switching its database providers from the default FME Database to a PostgreSQL database to allow for more control over database security.

Miss Vector says...

*If you have completed the Configuring for HTTPS exercise, remember that the URL to connect to FME Server is now https://localhost:8443/fmeserver and NOT http://localhost/fmeserver!*

1) Backup FME Server

Backing up your current FME Server instance is an important step before performing any post-installation configurations. Once you have changed the database provider, you can restore FME Server configurations all at once instead of having to go through the process of manually changing any settings, republishing workspaces, etc.

Note: If you have already created an FME Server backup you can use this existing .fsconfig file and continue to Step 2.

Open the FME Server web interface, either through the Web Interface option on the Windows Start Menu or directly in your web browser, and log in using the username and password admin.

Find Backup & Restore in left sidebar, under the Admin heading in the FME Server web interface, and click to open this page.

Select Download to save a backup file of FME Server - this can be thought of as a "snapshot". It will take a short time to run processes in the background to compile the FME Server backup, and once this is complete it will automatically save to your local downloads folder.

2) Initial Database Configuration

For the purposes of this exercise a separate PostgreSQL database has been installed to the Training Machines, running on port 5432.

The next step is to configure this database for FME Server. From the Windows Start Menu, select PostgreSQL > SQL Shell to open the psql command prompt. Login using the username and password postgres - this is the root user for the database.

First, create a new user to assign ownership of the FME Server database. From the psql prompt, run the postgresql_createUser.sql script by entering the following command:

```sql
\i 'C:/apps/FMEServer/Server/database/postgresql/postgresql_createUser.sql'
```

This SQL script creates a new user fmeserver with password fmeserver.

Next, create the FME Server database by running the postgresql_createDB.sql script in the psql command prompt:

```sql
\i 'C:/apps/FMEServer/Server/database/postgresql/postgresql_createDB.sql'
```
This SQL script creates the FME Server database and grants all privileges on the database to the user fmeserver.

3) Create the FME Server Database Schema

Exit the psql command prompt to end the current session. Open a new session (Windows Start Menu > PostgreSQL > SQL Shell) and now login to the database fmeserver as the FME Server database user - using the username and password fmeserver.

From the command prompt, run the postgresql_createSchema.sql script by entering the following command:

```
\i 'C:/apps/FMEServer/Server/database/postgresql/postgresql_createSchema.sql'
```

This SQL script creates all FME Server related tables, indexes, views, and triggers.

4) (PostgreSQL Only) Allow Connections

Navigate to C:\Program Files\PostgreSQL\9.6\data\pg_hba.conf and open this file in a text editor in administrator mode.

Change the following lines:

```
host				all								all								127.0.0.1/32				md5
host				all								all								::1/128								md5
```

to:

```
host				all								all								0.0.0.0/0				md5
host				all								all								::/0				md5
```

Save and close the pg_hba.conf file.

In order for these changes to take effect, restart the PostgreSQL Database service. Open the Services application by using the Windows Start Menu and typing in Services. In the Services application, right-click postgresql-x64-9.6 and select Restart.

5) Configure the Database Connection

Open the fmeCommonConfig.txt file, located in the C:\apps\FMEServer\Server\ directory, using a text editor in administrator mode.

Under the heading FME SERVER SETTINGS START, locate the section titled Database Connection and update the DB_JDBC_URL parameter for the PostgreSQL database:

```
DB_JDBC_URL=jdbc:postgresql://localhost:5432/fmeserver
```

Save and close the fmeCommonConfig.txt file, and then Restart FME Server.
6) Post-Configuration Script
Finally, open C:\apps\FMEServer\Utilities, and invoke `runPostInstall.bat` by right-clicking the file and selecting `Run as administrator`.

This script will take a couple of minutes to create the default FME Server Publisher and Subscriber protocols, add FME Server cleanup tasks, and add the "Samples" repository.

7) Restore Your FME Server Configuration
Since a backup of FME Server was created in Step 1, we can now restore that same FME Server instance which contains all of the previous FME Server configuration settings.

Login to the FME Server web interface and select `Backup & Restore > Restore` from the left sidebar.

Upload your saved backup configuration file from the beginning of this exercise. Navigate to C:\Users\Administrator\Downloads\ and locate the FME Server backup file (Hint: It has .fsconfig extension!). Drag-and-drop this file onto the FME Server Restore page:

The FME Server web interface will report if the restore is successful. If it is not, the log file is easily accessible from this page if further investigation is needed.

**CONGRATULATIONS!**
By completing this exercise you have learned how to:
- Change the database provider for FME Server
Exercise 2: Changing the FME Server Database Provider
System Cleanup

When FME Server is used heavily for a long period of time, a number of files can build up and use system resources. These files are either resource files (including multiple types of log files) or are job history records.

Both of these are cleaned up automatically by FME Server using tasks defined on the System Cleanup page of the FME Server web interface.

Resources

The System Cleanup page looks like this:

![System Cleanup Page]

Notice that there are multiple types of logs and results files that can be cleaned. Each of these entries represents a task that is run automatically by FME Server from time-to-time. When the task runs and finds files of the specified type, that are older than the specified age, those files are deleted.

Should you wish to keep the files for longer than the pre-defined period you may either edit the file age setting (click on the specific System Cleanup Task to open a dialog for this), select and remove the task, or simply disable that task.

It’s also possible to set up new tasks that search for files and clean them up. For example, you might create a cleanup task to remove files that are periodically uploaded to a resources folder.
(Example) Delete_Job_Logs

The Delete_Job_Logs configuration looks like this:

It's a lot more simple compared to resource file cleanup tasks because there is only one type of information to specify. In this case, you only need to set the maximum length of time that job history is kept for before being removed - and do not have to worry about setting the filter type or pattern.

Miss Vector says...

**What exactly are the entries in the resources cleanup dialog?**

1. They are simply shortcuts to workspaces in the utilities category that I can run on demand.
2. They are simply shortcuts to scheduling tasks that run at the described interval.
3. They are specific tasks that FME Server runs once a day to help in system maintenance.
4. They are specific tasks triggered when the system is low on resources.
Chapter Review

This chapter introduced you to concepts and configurations regarding FME Server scalability and performance.

What You Should Have Learned from this Module

Theory

- Job Queues are used to send specific jobs to specific engines.
- Job Tags are used to assign specific jobs, or all jobs in a repository, to specific engines.
- You can have as many FME Engines as you want so long as the host’s CPU and memory resources can handle the number.
- You can change your database provider at any time. PostgreSQL, Microsoft SQL Server, and Oracle databases are supported with FME Server.
- FME Server periodically clears out resources and job history records that are older than the specified age.

FME Skills

- The ability to configure Job Queues.
- The ability to route a job through a specific engine.
- The ability to change the database provider for FME Server.
- The ability to configure a database for use with FME Server.
Questions and Answers

Here are the answers to the questions in this chapter.

Miss Vector says...

What exactly are the entries in the resources cleanup dialog?

1. They are simply shortcuts to workspaces in the utilities category that I can run on demand.
2. They are simply shortcuts to scheduling tasks that run at the described interval.
3. **They are specific tasks that FME Server runs once a day to help in system maintenance.**
4. They are specific tasks triggered when the system is low on resources.

These are their own set of tasks, separate to anything defined as a schedule or utility workspace. They are run once a day and remove any specified file older than the set time. However, #4 is partially correct - when the system’s free disk space reaches specified minimum levels, FME Server will trigger a critical level cleanup event in which all enabled cleanup tasks execute. The difference being it will disregard the Remove Files Older Than setting.
Server Dashboards

The FME Server Dashboards panel is used to display reports that show the general health of the FME Server installation.

There are five default reports that exist in FME Server:

<table>
<thead>
<tr>
<th>Name</th>
<th>Last Updated</th>
</tr>
</thead>
<tbody>
<tr>
<td>DailyTotalJobs</td>
<td>Yesterday at 15:33:31</td>
</tr>
<tr>
<td>DailyTotalRunningTime</td>
<td>Yesterday at 15:27:04</td>
</tr>
<tr>
<td>FailuresByWorkspace</td>
<td>Yesterday at 15:17:12</td>
</tr>
<tr>
<td>DailyTotalQueuedTime</td>
<td>Yesterday at 15:16:12</td>
</tr>
<tr>
<td>AverageRunningTime</td>
<td>Yesterday at 15:04:57</td>
</tr>
</tbody>
</table>

Each of these reports are simple HTML files. Clicking on a link opens that file in which a graph displaying the report information is stored:

In the above image, for example, the report shows how many jobs have been run on FME Server per day.
Police Chief Webb-Mapp says...

_These reports are generated using - what else - FME workspaces! These workspaces use the HTMLReportGenerator transformer and HTML format writer to create the graphs shown in reports._

_These are fairly simple workspaces and it is entirely possible to create your own reports - preferably by using an existing report as a template workspace. The Dashboards documentation explains how, but - in brief - any HTML document that is written to the folder resources\dashboards\dashboards will appear as a report in the Dashboards panel of the server web interface._

Generating and Using Reports

The reports in the dashboard panel are not generated and/or updated by default. To have them appear - and be updated - you must carry out the following steps:

1. In the FME Server web interface, click _Run Workspaces_ and choose the **Dashboards** repository.
2. Run the workspace **JobHistoryStatisticsGathering.fmw** to generate updated statistics.
3. Return to _Run Workspaces_ and choose the **Dashboards** repository again.
4. Run the workspace for the report you wish to add/update; for example **DailyTotalJobs.fmw**.
5. Click **Dashboards**.
6. Click on the chosen report to see the latest statistics.

The workspace **JobHistoryStatisticsGathering.fmw** is also set up to run on a schedule. The schedule is called **DashboardStatisticsGathering**, runs every 24 hours, and is set to **Disabled** by default. Therefore to get daily statistics - automatically - requires this schedule to be first enabled.
32- and 64-bit Engines on Same Machine

In some cases, you may want to install 32- and 64-bit Engines on the same machine. For example, you may currently be running only 64-bit engines, but you want to run a workspace from FME Server containing a format that runs only on a 32-bit engine.

Police Chief Webb-Mapp says...

WARNING! This procedure removes the ability to configure FME Engines on the Engines & Licensing page of the web interface. Run the same bit version of FME Engines unless absolutely necessary.

Use Job Queues to configure specific jobs to run on the new engine.

Miss Vector says...

Which bit combinations are possible on the same machine?

1. 32-bit engine on a 64-bit machine.
2. 64-bit engine on a 64-bit machine.
3. 64-bit engine on a 32-bit machine.
4. 32-bit engine on a 32-bit machine.
Configuring Custom Coordinate Systems/Grid Transformations

Workspaces that are run from FME Server can use custom formats, custom transformers, and custom coordinate systems in the same way that FME Workbench does. There are three ways to upload these shared custom resources to FME Server:

- **Use the Resources page of the FME Server web interface**: this method makes custom formats, custom transformers, and custom coordinate systems available to all workspaces on FME Server.
- **Publish to FME Server**: makes a custom format or custom transformer available to all workspaces in the same repository to which it is published.
- **Publish to FME Server with a Workspace**: this method allows you to add resources when publishing a workspace. You can upload the resources to a repository or to a shared resource folder. If you upload to a shared resource folder, the resources are available to all other workspaces on FME Server. If you choose a repository, the resources are available to all other workspaces in the same repository to which the current workspace is published.

If custom coordinate system files are uploaded to any of the applicable Engine subfolders, the FME Server Engines service must be restarted before they can be used in a workspace. These include the CoordinateSystemsExceptions, CoordinateSystemGridOverrides, CoordinateSystems, and CsmapTransformationExceptions subfolders.
Using Python with FME Server

If you run workspaces from FME Server that reference Python, the FME Engines must know which Python interpreter to use. For workspaces built with FME Desktop 2016 or later, the interpreter is determined by the setting of the Python Compatibility workspace parameter. For workspaces built with previous versions of FME Desktop, the interpreter is determined by the Preferred Python Interpreter setting.

Changing the Python Interpreter

For workspaces built with the FME Desktop 2016 or later, the Python interpreter you want the FME Engines to use must be specified in the workspace, according to the Python Compatibility workspace parameter.
Using R with FME Server

To execute R scripts from FME Server, such as through the RCaller transformer in an FME Desktop workspace, you must perform the following on all machines that run FME Engines:

1. Install R.
2. Install the sqldf package for R.

Alternatively, you can direct FME Server to an R interpreter that is installed in a non-standard location.
Adding Shared Resources

The Resources page is a convenient way to store and access the following:

- FME Server backup files.
- HTML reports generated for Dashboards.
- Data files that can be shared between different workspaces that are run from FME Server, regardless of repository.
- FME Engine Resources, including custom formats, custom transformers, custom coordinate systems, and custom Java and Python modules, that can be shared between different workspaces that are run from FME Server.
- FME Server and database log files.
- Connections to your own network resources and Amazon Web Services (AWS) S3 buckets.
- Temporary files created by FME Server.

Uploading Files and Folders

1. To overwrite existing files with the same names as those being uploaded, select Overwrite Existing Files.
2. Select Upload and specify whether to upload an entire folder, or specific files. Alternatively, drag and drop a file or folder on to the page.

Sharing Resources

To share a resource, click the Share with Others icon. Through sharing, you can grant levels of permissions on an item to other users. You can share an item if you own it, or if you are a user with Manage Security permissions, such as an administrator.

Miss Vector says...

How would you allow other users to access shared resources?

1. Grant permissions to specific users.
2. Grant permissions to a role.
3. Tag a user you want to share the resources with when you upload the file(s).
Database Connections

Many workspaces that are run from FME Server require you to connect to and authenticate a database service. For example, a workspace that contains an Oracle Spatial Relational reader requires you to provide a service name, username, and password to connect to an Oracle Spatial Relational dataset.

FME Server allows you to store these authentication parameters as self-contained objects, and the Database Connections page provides a convenient and secure way to manage them. When you run a workspace from FME Server that requires a database connection, you can reference the connection name, rather than re-entering the connection parameters. If the connection parameters change, you can edit them in one place, rather than in each workspace that uses the connection.

Using Database Connections

When you run a workspace, any connections that are compatible with the database type in the workspace appear in the Connection drop-down list, under Published Parameters.

Adding Database Connections

There are three ways to add database connections:

1. **FME Server web interface > Connections > Database Connections**: Click New. On the Create New Database Connection page, provide a name for the connection, and specify the type of database. Provide the remaining connection and authentication parameters, depending on type. Click OK.

2. **FME Server web interface > Connections > Database Connections**: Check the box beside an existing connection and click Duplicate. On the Duplicating “<DatabaseConnectionName>” page, provide a name for the connection, and the remaining connection and authentication parameters, depending on the type of database. Click OK.

3. **From FME Workbench**: When you upload a workspace that contains a database connection to FME Server, you can specify whether to upload the connection along with the workspace, or use a connection that already exists on FME Server. If you choose to upload the connection, it is added to this page.

Editing Database Connections

Click on a connection name. On the Editing Database Connection page, specify the new parameters, and click OK.

Sharing Database Connections

To share a connection, click the Share with Others icon. Through sharing, you can grant levels of permissions on an item to other users. You can share an item if you own it, or if you are a user with Manage Security permissions, such as an administrator.

Removing Database Connections

Check the box beside one or more connections you want to remove, and click Remove. In the confirmation dialog, click OK.
Web Connections

The Web Connections page lists the web connections you have uploaded to FME Server along with workspaces.

Many workspaces that are run from FME Server require you to connect and authenticate to a web service. For example, a workspace that contains an HTTPCaller transformer may require you to authenticate to a web service, such as Google Fusion Tables, by providing your username and password.

FME Server allows you to securely store and reference the authentication parameters to these web services as self-contained objects, in the same manner as they can be stored in FME Workbench. When you run a workspace from FME Server that requires a web connection, the credentials associated with the stored connection are also referenced, so you do not have to re-enter them.

Adding Web Connections

There are three ways to add web connections:

1. **On the Web Connections page:** Click New. On the Create Web Connection page, provide a name for the connection, and specify the type of service. Providing the remaining connection and authentication parameters, depending on type. Click OK. (Note: You can only add web connections for services to which FME Server is already registered. See ‘Managing Web Services’ below.)

2. **On the Web Connections page:** Check the box beside an existing connection and click Duplicate. On the Create Web Connection page, provide a name for the connection, and any remaining connection and authentication parameters, depending on the type. Click OK.

3. **From FME Workbench:** When you upload a workspace that contains a web connection to FME Server, you can specify whether to upload the connection along with the workspace. If you choose to upload the connection, it is added to this page.

Using Web Connections

Before you use a web connection for the first time from FME Server, you must authorize it, even if it has already been authorized in the workspace from FME Desktop.

1. Click on the connection to open it.
2. On the Edit page, click Authorize.

Removing Web Connections

Check the box beside one or more connections you want to remove, and click Remove. In the confirmation dialog, click OK.

Managing Web Connections

When you upload a workspace from FME Desktop that contains a web connection, a reference to the associated web service is also uploaded. To see the services that are uploaded, click Manage Web Services. The Web Services page opens. (To remove a web service from this page, select and click Remove).

To use the web services your connections reference, they must be registered with FME Server. There are two ways for this registration to occur:

1. In FME Desktop, when you upload a workspace that contains a web connection, and you complete the Add Service dialog for the service in the Publish to FME Server wizard.
2. Completing (or editing) setup in FME Server:
   - Click Manage Web Services.
   - On the Web Services page, click on the web service you want to edit.
On the Editing Web Services page, specify the service parameters. For most web services, you must provide authorization and connection credentials:

- **Client ID and Client Secret**: Credentials associated with an app. You must create an app in the web service and then retrieve the credentials for that app.

- **Redirect URI**: A web address that resolves to the location of the fmeoauth web application. If your FME Server is hosted on FME Cloud or another public networks, the default setting is likely correct. If FME Server is on-premises, you will likely need to change the URI. You must set the correct Redirect URI in the app you have created.
  - If your FME Server is configured to access web services through an entry in a public DNS service, use the Redirect URI generated from the service.
  - If your FME Server is configured to access web services through a DMZ, use the Redirect URI (https://<host>:<port>/fmeoauth) for the custom installation of the fmeoauth web service on the public machine.

- Click OK.
Exercise 1: Adding a Web Connection

<table>
<thead>
<tr>
<th>Data</th>
<th>C:\FMEData2017\Resources\ServerAdmin\DropboxWebConnection.xml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Goal</td>
<td>Authenticate a web connection for FME Server</td>
</tr>
<tr>
<td>Demonstrates</td>
<td>How to add and authenticate a web connection for Dropbox</td>
</tr>
<tr>
<td>Start Workspace</td>
<td>None</td>
</tr>
<tr>
<td>End Workspace</td>
<td>C:\FMEData2017\Workspaces\ServerAdmin\WebConnections-Ex1-Complete.fmw</td>
</tr>
</tbody>
</table>

Your GIS department is working with several other organizations on one big project. It is a lot to organize, so whenever there are additional files to be shared, each organization drops the file into the shared Dropbox for easy access for all organization members. Your task is to configure FME Server to access the Dropbox.

Miss Vector says...

*If you have completed the Configure for HTTPS exercise, remember that the URL to connect to FME Server is now [https://localhost:8443/fmeserver](https://localhost:8443/fmeserver) and NOT [http://localhost/fmeserver](http://localhost/fmeserver)!*

1) Create a Workspace
You must first create a Dropbox web connection. The first step in creating this web connection is to have a workspace to run! Open FME Workbench and create a new Blank Workspace.

The DropboxConnector transformer can access a Dropbox account and perform Delete, Download, List, and Upload actions.

Add a Creator transformer, and a DropboxConnector transformer to the workspace. Join the Creator to the DropboxConnector.

Add a Logger transformer connected to the Output port of the DropboxConnector.

2) Configure DropboxConnector and Create Web Connection
You'll notice the DropboxConnector has a red cog wheel indicating that it has required parameters to be filled in. Select DropboxConnector and open the parameters dialog or view them via the Parameter Editor pane.

Change the Dropbox Action to List.

Then select the dropdown for Dropbox Connection and select Add Web Connection.... The Dropbox Connection dialog box opens.

Set the Connection Name to DropboxWebConnection and click Authenticate....
This opens a new window with a direct, secure connection to Dropbox. Fill in the Web Service Authentication credentials as follows:

- **Email:** fmedropbox@gmail.com
- **Password:** <distributed_during_course>

...and then click **Sign in**.

Note: The above email and password should be used solely for this exercise. You can use your own Dropbox account, but for this course we have provided an account to use.

Click **Allow** to allow FME to access the Dropbox account.

Your **DropboxConnector** parameters should now look like the following:

Click **OK** to apply the changes.
3) Run the Workspace
It is a best practice to first run the workspace in FME Desktop before uploading it to FME Server. If the workspace does not run in FME Desktop, then it will not run in FME Server!

Click Run to make sure the translation is successful. Now we are ready to publish the workspace to FME Server.

4) Publish to FME Server
Select Publish to FME Server under the File Menu. Use the Publish to FME Server Wizard to place the workspace in the Training repository – create one if it doesn’t exist.

On the Upload Connections step, make the DropboxWebConnection is selected and click Next. We will authorize our web connection using the FME Server web interface.

[Image of the Publish to FME Server interface]

Make sure that the workspace is registered with the Job Submitter FME Server Service. Click Publish.

5) Login to FME Server
Open the FME Server web interface, either through the Web Interface option on the Windows Start Menu or directly in your web browser (https://localhost:8443/fmeserver), and log in using the username and password admin.

6) Configure the Dropbox Web Service
From the left sidebar go to Connections > Web Connections.

Click Manage Web Services on the Web Connections page.

[Image of the Web Connections page]

Select Dropbox. The Editing Web Service "Dropbox" page opens.

Fill in the Client Information parameters as follows:

- Client Id: lxx2amcu6xs11r
Client Secret: `<distributed_during_course>`
Redirect Uri: https://localhost:8443/fmeoauth

The Client Id and Client Secret are how you connect your client to the web service. They are generated when you create a new API app for a web service. REST API Documentation pages such as this one for Dropbox explains in more detail about web service app creation.

Click OK to save these updates.

7) Authorize Web Connection

Go back to Connections > Web Connections

Select DropboxWebConnection in your list of Web Connections.

On the Edit page, click the Authorize button:

A window opens with the login screen for Dropbox. Sign in with:

- Email: fmeserver2017@gmail.com
- Password: `<distributed_during_course>`

The window closes and a message pops up:

You have now successfully authorized a Dropbox web connection in FME Server for you to use in your workspaces!

CONGRATULATIONS!

By completing this exercise you have learned how to:
- Access a web service
- Publish a web connection to FME Server
- Configure a web service in FME Server
- Authorize a web connection on FME Server
Chapter Review

This chapter introduced you to some of the options for customizing an FME Server installation.

What You Should Have Learned from this Module

Theory

- Dashboards display reports about FME Server general health.
- 32- and 64-bit engines can be installed on the same machine, but a 64-bit engine will not run on a 32-bit version of Windows.
- Custom formats, transformers, and coordinate systems can be uploaded to FME Server.
- Custom coordinate system files uploaded to any of the applicable Engine subfolders will require the FME Server Engines service to be restarted before they can be used in a workspace.
- FME Server is compatible with Python.
- FME Server is compatible with R.
- You can share resources with other users.
- Database connections can be created and saved for future use on the Database Connections page.
- Web connections can be created and saved for future use on the Web Connections page.

FME Skills

- The ability to upload a file or folder, share the resource with others, and grant levels of permissions on the item if desired.
- The ability to add and manage web connections.
# Questions and Answers

Here are the answers to the questions in this chapter.

## Miss Vector says...

**Which bit combinations are possible on the same machine?**

1. **32-bit engine on a 64-bit machine.**
2. **64-bit engine on a 64-bit machine.**
3. **64-bit engine on a 32-bit machine.**
4. **32-bit engine on a 32-bit machine.**

_Numbers 1, 2 and 3 are all possible combinations for FME Server._

## Miss Vector says...

**How would you allow other users to access shared resources?**

1. **Grant permissions to specific users.**
2. **Grant permissions to a role.**
3. **Tag a user you want to share the resources with when you upload the file(s).**

_Permissions on an item can be granted directly to a user, or indirectly by granting permissions to a role._
Troubleshooting
Initial Troubleshooting

Verification

After performing each of the following solutions, you can verify if the issue has been corrected by running through a quick verification process for either Windows or Linux.

Restart FME Server

Restart FME Server and make sure all the Windows services are running. If any services fail to start, then reboot the operating system and try to restart the services again.

Look for Orphan Processes

An orphan process is a computer process whose parent process has finished or terminated, though it remains running itself. In this case we are looking for unintentionally orphaned processes, such as when the parent process terminates or crashes. To find these, stop all services listed in the documentation (FME Server System Services), and proceed as follows:

Windows

- Open the Task Manager and look for any orphaned processes starting with FME (often found under the Details tab). If any are found, end those processes and start the services again.

Linux

- Run the following command to list processes:

  ```bash
  \# ps -A
  ```

  Look for the processes as described in the linked documentation article above. For reference, these may include:

  - **fme** – one for each running FME Engine
  - **FMEServer** - FME Server Core
  - **FMEScheduler** - FME Server scheduler - requires the core to be running
  - **FMENotifier** - FME Server notifier - requires the core to be running
  - **FMESubscriber** - FME Server subscriber - requires the core to be running
  - **FMERelayer** - FME Server Relay Manager
  - **FMESMTPRelay** - FME Server Email receiver
  - **FMEWebSocket** - FME Server WebSocket Server
  - **FMECleanup** - FME Server Cleanup service
  - **tomcat7** – FME Server Web Application Server
  - **postgres** – FME Server Database Server

  For example, you might see listed: 53521 pts/3 00:00:03 fme

  To stop this process, run the following:

  ```bash
  # kill 53521
  ```
**Restart the System**

Restart the operating system. Perform the verification linked above and see if the problem still exists.

**Revert any Recent Changes**

Check if there have been any recent changes on the machine. Has a software update been applied or new hardware added? Configuration files edited? If so, try reverting the system to the state prior to the update and see if that resolves the issue.
FME Server Log Files

Read the FME Server Log Files for error messages. This can be quite helpful to find the cause of an issue.

**Access from the Web Interface**
Open the web interface and navigate to the Resources page to access the log files.

**Access from the File System**
If the web interface is not accessible, you can access the log files from the FME Server System Share: \resources\logs

The FME Server System Share location can be specified at install times. By default it is set to C:\ProgramData\Safe Software\FME Server on Windows.

**What to look for in FME Server Log Files**

Within the logs there are three types of messages: Inform, Warn and Error. You should be looking for Warning and Errors in the logs. Inform messages may not signify a problem, even if the word “Error” is located within its text.

Example **Inform Error**:

```
2013-05-09 13:54:20 | 0.9 | 0.0 | INFORM | FAILURE_RESPONSE !FME_ERROR_NUMBER!:!FME_ERROR_MSG!
```

Example **Warn Error**:

```
```

Example **Error**:

```
```

If a Warn/Error message is encountered, it may be beneficial to search the documentation and FME Knowledge Center for the error text in order to find assistance.
Additional Troubleshooting

Some additional troubleshooting techniques.

FME Workbench-FME Server Connection

If you are unable to connect from FME Workbench to FME Server then the following suggestions may be of help:

- Check if there is a firewall running on either your computer or the FME Server. If so, you must open port 80 (or 8080) to use the Web Connection. A popular tool for checking ports is netstat, a command line utility on Windows, or telnet on Linux systems.
- Restart the FME Server Services. On Windows, go to Start > Programs > FME Server > right-click Restart FME Server and select Run as administrator.

Web Interface

If you are unable to access the web interface then the following suggestions may be of help:

- Confirm that FME Server is installed and running! The easiest way to be sure is to restart FME Server using Start > Programs > FME Server > Restart FME Server
- Check whether FME Server was installed using an application server port other than 80. For example, if port 80 was already being used the installer might have used a different port; 8080 is most common. To check, try entering the URL with this syntax http://<host>:<port>/fmeserver - for example http://localhost:8080/fmeserver

Workspaces are Queued but not Run

If a workspace appears in the FME Server queue, but is never executed, then it may be because no engines are running.

- Check the web interface (Engines & Licensing > Engine Management) to confirm engine status. If no engines are available, check licensing and update as necessary. Restart FME Server once a proper license is in place.

Workspaces Fail when Run

If a workspace fails when it is being run then the following suggestions may help:

- Run the workspace first on FME Desktop. If it does not work there, it may not work on FME Server.
- Data paths can cause problems when moving from a local Desktop machine to a Server environment. Check the dataset parameters (Reader and Writer) to ensure they are not referring to a local path that does not exist on the Server. You may need to change the parameter to use the Resources dialog (Browse) and not a file path dialog (Specify Location). File permissions and the service account used to run the FME Server Windows Services is commonly the fault.
- Check the FME log file using Jobs > Completed in the web interface. This may help to explain why there is a problem.

Scheduling

If a scheduled workspace appears to have not been run at the expected time then the following suggestions may be of help:

- Ensure an engine is available, and that the scheduled job is not in a queue.
- Check the date and time very carefully to ensure the correct values were entered.
Check the timezone is correct. The web interface operates on local timezone, which is not necessarily the same timezone as where the server is physically located.

**Cannot Connect to WebSockets Server**

If you cannot connect to a WebSockets server then the following may be of help:

- Ensure the FME Server's WebSockets port (default 7078) is open.
- Ensure you are using the correct stream_id for sending and receiving between your applications.
FME Knowledge Center

The FME Knowledge Center has an extensive collection of articles and Q&A postings. Post a question for others in the FME community or check if someone else had the same question and already received an answer!

One particular set of articles, the FME Server Troubleshooting Guides, identify several commonly encountered FME Server issues and their resolutions. It is an excellent resource for troubleshooting!

BrianAtSafe posted
FME Server Troubleshooting Guide
5 days ago in *FME Server

RichardAtSafe posted
FME Server Troubleshooting: Cleanup Tasks
6 days ago in *FME Server

jutherthomas posted
FME Server Troubleshooting: Users/Roles
Oct 12, '17 in *FME Server

jutherthomas posted
FME Server Troubleshooting: Tokens
Oct 12, '17 in *FME Server

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FME Server Troubleshooting: Log Files
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FME Server Troubleshooting: Integrated Windows Authentication or Single Sign On
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FME Server Troubleshooting: Active Directory
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RylanAtSafe posted
FME Server Troubleshooting: Repositories
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FME Server Troubleshooting: Projects
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RylanAtSafe posted
FME Server Troubleshooting: Schedules
Oct 17, '17 in *FME Server
Course Wrap-Up

Although your FME training is now at an end, there is a good supply of expert information available for future assistance.
Product Information and Resources

Safe Software Web Site

The Safe Software web site is the official information source for all things FME. It includes information on FME products, Safe Software services, FME solutions, FME support and Safe Software itself.

Safe Support Team

Behind FME are passionate, fun, and knowledgeable experts, ready to help you succeed, with a support team philosophy built on the principle of knowledge transfer.
Your Local Partner

Safe Software has partners and resellers around the world to provide expertise and services in your region and your language.

You can find a list of official partners on the Safe Software web site.

Safe Software Blog

The Safe Software blog provides technical information about FME, articles about customers' use cases, and general thoughts on spatial data interoperability.
FME Manuals and Documentation

For FME Server documentation, look on our web site under Learning & Support > Documentation.

For FME Desktop use the Help function in FME Workbench to access help and other documentation. Alternatively, look on our web site under the Learning & Support > Documentation.
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<th>Product Information and Resources</th>
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### FME Desktop

- **FME Desktop Administrator’s Guide**
  - Find out how to install and license your version of FME Desktop, and perform other administrative tasks. *(PDF Version)*

- **FME Reader and Writers**
  - A detailed technical guide to the many reader and writer formats available in FME.

- **FME Workbench**
  - A guide to FME’s primary graphical tool for creating and running data transformations.

- **FME Transformer Reference Guide (PDF)**
  - A quick reference describing each transformer’s functionality.

- **FME Workbench Transformers**
  - A detailed technical guide to the many transformers available in FME Workbench.

- **FME Data Inspector**
  - A guide to FME’s graphical tool for inspecting transformation results and other datasets.

- **FME Integration Console**
  - Find out how to extend your "FME-ready" third party applications so they will integrate with FME Desktop.

- **FME Quick Translator**
  - Use this tool to perform simple, automatic data conversions.
Community Information and Resources

Safe Software actively promotes users of FME to become part of the FME Community.

The FME Knowledge Center

The FME Knowledge Center is our community web site - a one-stop shop for all community resources, plus tools for browsing documentation and downloads.

Knowledge Base

The FME Knowledge Base contains a wealth of information; including tips, tricks, examples, and FAQs. There are sections on both FME Desktop and FME Server, with articles on topics from installation and licensing to the most advanced translation and transformation tasks.

Community Answers

FME community members post FME-related messages, ask questions, and share in answering other users’ questions. Members earn “reputation” and “badges” and there is a leaderboard of the top-participating users. Come and see how they can help with your FME projects!

Ideas Exchange

FME development is very much user-driven. The Ideas Exchange gives users the chance to post their ideas for new FME functionality, or improvements to existing functionality, and allows everyone to vote on the proposed ideas. The more votes an idea gets, the more likely it is to be implemented!
The FME Channel

This FME YouTube channel is for those demos that can only be properly appreciated through a screencast or movie. Besides this there are a host of explanatory and helpful movies, including recordings of most training and tutorials.
Feedback and Certificates

The format of this training course undergoes regular changes prompted by comments and feedback from previous courses.

Course Feedback

**Miss Vector says...**

*There's one final set of questions – and this time you'll be telling me if the answers are correct or not!*

Safe Software greatly values feedback from training course attendees and our feedback form is your chance to tell us what you really think about how well we're meeting your training goals.

You can fill in the feedback form now, but you'll also be reminded by email shortly after your course. Safe Software's partners who carry out training may ask that you fill in a separate form, but you can also use the official Safe Software form if you wish.

Certificates

**Mr. E. Dict, (Attorney of FME Law)says...**

*In order to prove you have taken this training course, a certificate will be emailed automatically to anyone who was logged on for the duration of Safe Software hosted courses.*
Thank you for attending this FME training course.