

Terracotta Installation Guide

Version 10.5

October 2019

This document applies to Terracotta and Terracotta Ehcache Version 10.5 and to all subsequent releases.

Specifications contained herein are subject to change and these changes will be reported in subsequent release notes or new editions.

Copyright © 2010-2019 Software AG, Darmstadt, Germany and/or Software AG USA Inc., Reston, VA, USA, and/or its subsidiaries and/or its affiliates and/or their licensors.

The name Software AG and all Software AG product names are either trademarks or registered trademarks of Software AG and/or Software AG USA Inc. and/or its subsidiaries and/or its affiliates and/or their licensors. Other company and product names mentioned herein may be trademarks of their respective owners.

Detailed information on trademarks and patents owned by Software AG and/or its subsidiaries is located at <http://softwareag.com/licenses>.

Use of this software is subject to adherence to Software AG's licensing conditions and terms. These terms are part of the product documentation, located at <http://softwareag.com/licenses> and/or in the root installation directory of the licensed product(s).

This software may include portions of third-party products. For third-party copyright notices, license terms, additional rights or restrictions, please refer to "License Texts, Copyright Notices and Disclaimers of Third Party Products". For certain specific third-party license restrictions, please refer to section E of the Legal Notices available under "License Terms and Conditions for Use of Software AG Products / Copyright and Trademark Notices of Software AG Products". These documents are part of the product documentation, located at <http://softwareag.com/licenses> and/or in the root installation directory of the licensed product(s).

Use, reproduction, transfer, publication or disclosure is prohibited except as specifically provided for in your License Agreement with Software AG.

Table of Contents

About This Documentation.....	5
Online Information and Support.....	5
Data Protection.....	6
Installation Overview.....	7
Installing using the Software AG Installer.....	9
Performing the Native Installation Procedure.....	11
Configuring Your Environment.....	13
Evaluation Licenses.....	17
System Requirements.....	19
Planning a Successful Deployment.....	21

About This Documentation

Online Information and Support

Software AG Documentation Website

You can find documentation on the Software AG Documentation website at "<http://documentation.softwareag.com>". The site requires credentials for Software AG's Product Support site Empower. If you do not have Empower credentials, you must use the TECHcommunity website.

Software AG Empower Product Support Website

If you do not yet have an account for Empower, send an email to "empower@softwareag.com" with your name, company, and company email address and request an account.

Once you have an account, you can open Support Incidents online via the eService section of Empower at "<https://empower.softwareag.com/>".

You can find product information on the Software AG Empower Product Support website at "<https://empower.softwareag.com/>".

To submit feature/enhancement requests, get information about product availability, and download products, go to "[Products](#)".

To get information about fixes and to read early warnings, technical papers, and knowledge base articles, go to the "[Knowledge Center](#)".

If you have any questions, you can find a local or toll-free number for your country in our Global Support Contact Directory at "https://empower.softwareag.com/public_directory.asp" and give us a call.

Software AG TECHcommunity

You can find documentation and other technical information on the Software AG TECHcommunity website at "<http://techcommunity.softwareag.com>". You can:

- Access product documentation, if you have TECHcommunity credentials. If you do not, you will need to register and specify "Documentation" as an area of interest.
- Access articles, code samples, demos, and tutorials.
- Use the online discussion forums, moderated by Software AG professionals, to ask questions, discuss best practices, and learn how other customers are using Software AG technology.
- Link to external websites that discuss open standards and web technology.

Data Protection

Software AG products provide functionality with respect to processing of personal data according to the EU General Data Protection Regulation (GDPR). Where applicable, appropriate steps are documented in the respective administration documentation.

1 Installation Overview

This installation guide describes how to install and configure the products Terracotta and Terracotta Ehcache.

You can install your Terracotta product in two different ways:

- By using the Software AG Installer. This simplifies the integration with other Software AG products, such as the components of the webMethods product suite.

Refer to the section [“Installing using the Software AG Installer”](#) on page 9 for details.

The availability of this alternative may depend on your product licensing options.

- As a self-contained, standalone installation.

Refer to the section [“Performing the Native Installation Procedure”](#) on page 11 for details.

Overview of Product Components

The installation procedure for Terracotta places the following components on your machine. You can select all of the components for installation or just a subset:

1. **Terracotta Server:** The server component that manages the resources of all of the Ehcache caches and TCStore stores. For information about this component, see the *Terracotta Server Administration Guide*.
2. **Cluster tool:** A command-line utility that allows you to perform a variety of server and cluster management tasks. You require this tool in order to install the license file on the server and make it usable, regardless of whether your server configuration is single-node or multi-node. For information about this component, see the related section in the *Terracotta Server Administration Guide*.
3. **Management Console:** The browser-based graphical user interface that allows you to monitor and manage the current status of all caches and stores managed by the Terracotta Server. For information about this component, see the *Terracotta Management Console User Guide*.
4. **Ehcache Client Libraries:** The Ehcache API client libraries that you integrate into your Ehcache-based applications. These libraries are available both as OSGi and non-OSGi builds. For information about using the Ehcache API, see the *Ehcache API Developer Guide*.
5. **TCStore Client Libraries:** The TCStore API client libraries that you integrate into your TCStore-based applications. These libraries are available both as OSGi and non-OSGi builds. For information about using the TCStore API, see the *TCStore API Developer Guide*.

If you are installing Terracotta Ehcache, the product scope does not include the TCStore component. Therefore the installation procedure allows you to install the same components as for Terracotta, except the **TCStore Client Libraries** component.

Licensing

As part of the installation procedure, you will need the product license file that you receive as part of the product delivery.

If you install Terracotta using the Software AG Installer, you will be asked to provide the license file during the installation process if you select the cluster tool sub-component. The Installer renames the file if necessary, and places it under the default location, which is `/tools/cluster-tool/conf` under the product installation location, so that it is discovered automatically during the cluster configuration phase later.

If you install using the native installation procedure, you can put the license file manually under the default location, or provide it at the time of cluster configuration.

List of System Requirements

For a list of system requirements such as supported operating systems and web browsers, see the section [“System Requirements” on page 19](#).

Working in a Distributed Environment

If you intend to use Terracotta in a distributed environment with multiple nodes (i.e. physical machines), you will typically aim to set up the following configuration:

- a Terracotta Server installation on as many nodes as desired;
- a Cluster Tool installation on at least one node (could be one of the server nodes);
- the Terracotta Management Console on one node (should not be one of the server nodes, can be same as the Cluster Tool node);
- API Client libraries on application nodes.

These components are individually selectable when you use the Software AG Installer to perform the installation.

Note on Upgrading from previous Product Releases

There is no upgrade path or data migration path from Terracotta v4.x products to the current product version.

There is also no upgrade path or data migration path from Terracotta Ehcache 10.0 to the current product version.

2 Installing using the Software AG Installer

You can install your licensed Terracotta software using the Software AG Installer. The Software AG Installer is a generic tool for installing Software AG products. See the section [“Documentation for using the Software AG Installer”](#) on page 9 below for details of use.

Performing the Installation

To perform the installation, proceed as follows:

1. Before you start the Software AG Installer, copy your Terracotta product license file to the file system, so that it can be accessed during the installation procedure.
2. Run the Software AG Installer, as described in the document **Using the Software AG Installer** (see below for information).
3. In the **Product** panel, expand the node **Terracotta**. If you want to install just selected components of the product, you can expand this node and select the required components. See the description of the product components in [“Installation Overview”](#) on page 7.
4. In the **License** panel, specify the path of the license file.
5. In all subsequent dialogs, you can select the default settings.

Documentation for using the Software AG Installer

For the installation using the Software AG Installer, refer to the document *Using the Software AG Installer*. This document describes how to use the Software AG Installer tool.

The usage of the Software AG Installer is the same for all products, so the documentation of the Software AG Installer does not refer in detail to Terracotta products.

To access this document, do the following:

1. Log in to the Software AG documentation web site at [“http://documentation.softwareag.com/”](http://documentation.softwareag.com/), using the Empower login ID and password that you have received by email when you licensed the product.
2. Select the link for the Software AG Installer.
3. The selected page lists several versions of the installer documentation, each shown with a release date. Select the version of the installer documentation that corresponds to the release date of the Software AG Installer you are using. The release date of the Software AG Installer is generally included in the file name of the downloaded executable file. You can also find the release date of the Software AG Installer by clicking the "About" link when you run the Software AG Installer.

3 Performing the Native Installation Procedure

Overview

This document describes how to install your selected product (Terracotta or Terracotta Ehcache) using a native installation procedure. This procedure is an alternative to using the Software AG Installer, which is described in the previous section.

Terracotta and Terracotta Ehcache each have their own native installer kit. The main difference between these two native installer kits is that the Terracotta Ehcache kit provides the Ehcache API and associated functionality, whereas the Terracotta kit provides both the Ehcache API and the TCStore API and their associated functionalities.

In the following description of the installation procedure, any mention of TCStore applies only to the Terracotta product.

Performing the Installation

The product distribution kit is provided as an archive file containing Jar files, command line scripts and other associated files.

The installation procedure just consists of downloading the archive file from Software AG's Software Download Center (SDC) and expanding the archive file to a suitable disk location in your working environment.

When you order the product, you receive credentials from Software AG that allow you to access the SDC. Within the SDC, navigate to "Home > Products & Documentation > Download Products > Software Download Center", and select the entry for your ordered product to download the archive file.

After you have expanded the archive to a disk location in your working environment, the root folder of the expanded archive contains a `Readme.txt` file that summarizes the contents of the kit. We suggest that you read through the `Readme.txt` file to familiarize yourself with the contents of the kit.

In some cases, as noted below, you need to add components from the expanded archive to your classpath.

Deploying Terracotta components in the user application

The expanded archive contains the following Jar files:

1. `client/lib/terraccotta-common-client-<version>.jar`
2. `client/ehcache/terraccotta-ehcache-client-<version>.jar`
3. (Terracotta only, not Terracotta Ehcache) `client/store/terraccotta-store-client-<version>.jar`
4. `client/logging/slf4j-api-<version>.jar`

In order to use Terracotta components in your application, you need to add these Jar files to your application classpath.

Note: The Jar file in `client/logging` is the logging abstraction that Terracotta uses, and it requires a concrete implementation to offer logging. By default the native kit bundles `logback` in `client/logging/impl`, but you are free to choose any supported implementation. See the Simple Logging Facility for Java (SLF4J) pages at "<https://www.slf4j.org/>" for related information.

4 Configuring Your Environment

After you have installed the product as described above, there are various configuration activities that you will need to perform in order to set up the product environment and to run your application(s).

The installed API client jars need to be embedded in a customer application before they can run.

We suggest that you proceed as follows:

1. Familiarize yourself with the general concepts of the product.

For an overview of Terracotta, see the document *About Terracotta*.

For an overview of Terracotta Ehcache, see the document *About Terracotta Ehcache*.

2. Familiarize yourself with all the system requirements and recommendations.

In particular, considerations concerning deployment, storage hardware and using virtual machines should be evaluated according to what is recommended in the relevant sections of this documentation.

Further reading:

Planning a Successful Deployment (*Installation Guide*)

A Note on Working with VMware vMotion (*see section below*)

System Recommendations for Hybrid Caching (*in Terracotta Server Administration Guide > Configuring the Terracotta Server*)

System Recommendations for Fast Restart (FRS) (*in Terracotta Server Administration Guide > Configuring the Terracotta Server*)

3. Configure the Terracotta Server to define the offheap memory resources that you will use, and the size of each storage tier. This involves setting up an XML-formatted configuration file that contains all of the properties to define the configuration of the Terracotta Servers in a stripe.

For details, see the section *The Terracotta Configuration File* in the document *Terracotta Server Administration Guide*.

Note: If you intend to use a high availability (HA) topology, you need to consider how your application values *data consistency* versus *availability*.
See the section *Failover Tuning* in the *Terracotta Server Administration Guide*.

For various examples and explanations, check through the *Ehcache API Developer Guide* and *TCStore API Developer Guide*.

4. Start the Terracotta Server.

See the document *Starting and Stopping the Terracotta Server* in the *Terracotta Server Administration Guide* for instructions on starting the Terracotta Server.

Terracotta servers can be started without the need for the cluster tool to have run, but cannot be used until the cluster tool has been run.

5. If you intend to use a high availability (HA) topology, you can start several instances of the Terracotta Server one after the other, all using the same configuration file. Such a group of servers is termed a *stripe*. In a stripe, one of the servers becomes the active server and the others become passive servers. A stripe can also consist of just an active server and no passive servers.
6. To use Terracotta clustering features in your client applications, you will need to use the Cluster Tool to set up the cluster.

Whenever active and passive servers are running on one or more machines, the cluster tool can be used on one of the machines to create a cluster.

For a general overview of clustered caches, see the section *Clustered Caches* in the Ehcache API Developer Guide. For an overview of the cluster tool, see the section *The Cluster Tool* in the document *Terracotta Server Administration Guide*.

7. Develop your caching application(s) using the TCStore API or the Ehcache API.

See the *Ehcache API Developer Guide* for details of how to develop caching applications using the Ehcache API.

See the *TCStore API Developer Guide* for details of how to develop caching applications using the TCStore API.

8. Start your client application(s).
9. Check the status of the running system, such as which applications are running, which caches are in use, cache usage metrics etc., by using the Terracotta Management Console (TMC).

See the document *Terracotta Management and Monitoring* for details of the TMC.

Overview of Command Line Scripts

The distribution kit contains command line scripts that you can use to start and stop various components of the Terracotta environment. The table below lists the scripts that you will probably use most frequently. The file type of the scripts is ".bat" for Windows or ".sh" for UNIX-based systems.

Script	Description
server/bin/start-tc-server.bat(.sh)	Start the Terracotta Server. The Terracotta Server provides the distributed data platform for Terracotta products.

Script	Description
tools/cluster-tool/bin/ cluster-tool.bat(.sh)	Run the cluster tool. The cluster tool is a command line tool that allows you as an administrator of the Terracotta Server Array (TSA) to perform a variety of tasks in the area of cluster management.
tools/management/bin/ start.bat(.sh) tools/management/bin/ stop.bat(.sh)	Start or stop the Terracotta Management Console (TMC). The TMC is a graphical web-based application for managing and monitoring your Terracotta Server Array and connected clients.

A Note on Working with VMware vMotion

Software AG strongly recommends against allowing live migrations of virtual machine(s) with Software AG Terracotta server processes. This is because of the downtime introduced during the live migration process which can cause other Terracotta server processes to elect a new active server which will then create data consistency problems (such as split-brain scenarios) when the migrated process becomes live again.

If you must use vMotion in your environment, please make sure that Terracotta server processes and runtime processes are excluded from live migration. Be very thoughtful about any other VMs that you put on the same hardware - the workload within it may be disruptive to the resources available to the Terracotta server.

Applications utilizing Terracotta (Terracotta clients) can also experience disruption by live migrations - although they will normally automatically reconnect and resume operation in a healthy and well-resourced virtualized environment.

5 Evaluation Licenses

A Terracotta license file is required to run enterprise versions of Terracotta products.

Evaluation versions of Terracotta enterprise products expire after a trial period. Expiration warnings are issued both to logs and standard output to allow enough time to contact your supplier for an extension.

For information about how to install the full license, refer to the section *Licensing* in the *Terracotta Server Administration Guide*.

6 System Requirements

For information about supported operating systems, JVMs, application servers, web browsers etc, refer to the *Platform Support* section of "<https://confluence.terracotta.org/display/release/Home>" on the Terracotta Confluence web site.

7 Planning a Successful Deployment

A solid and proven concept of a production environment as well as adhering to best practices common to most all data storage software is the foundation of a successful deployment, free of troublesome interruptions of service.

The following sections is aimed to give crucial advice on the the dos and don'ts.

Ensure Proper, Dedicated System Resources

Terracotta Servers should be run on dedicated hardware. Software AG strongly discourages the use of virtualization (such as vmWare).

Servers should generally be resourced such that no more than 70% of memory and 50% of CPU is being utilized under "normal" peak conditions. This ensures capacity for abnormal spikes in service demand. Failure to follow these recommendations could also result in adverse actions taken by the operating system, such as the Linux OOM killer.

Avoid any deployments that over-commit the memory resources of the underlying hardware, e.g. do not use "swap" space for the processes running on the system.

When using persistence options such as FRS or Hybrid features, review and adhere to the "System Requirements" sections of the documentation related to these features.

In particular, ensure that you utilize local drives for storage.

Virtual Environments

Note: Use of dedicated physical hosts is recommended.

If you are deploying on virtual hosts (e.g. via vmWare), the Terracotta server process must be "pinned" to given hardware (e.g. excluded from live migration processes such as vMotion). Such virtual hosts must be configured with dedicated memory and CPU resources.

Similarly, for orchestrated container environments (e.g. Docker, Kubernetes, etc.), ensure that Terracotta server processes are fixed to given hosts, and are not subject to unexpected migration.

Be aware of avoiding "noisy neighbor" problems - where processes compete for physical system resources. This can lead to poor and/or unpredictable latency spikes and other performance and stability issues.

Running Multiple Terracotta Servers on the Same Host

Note: Running multiple instances on the same host is not recommended.

Ensure that Terracotta servers that are members of the same stripe (e.g. "active" and "mirror(s)" of the same stripe) are never assigned to the same physical host. This creates a single point of failure, and can result in data loss.

Additionally, if you do run multiple servers on the same host, it is strongly recommended that the processes run as separate users, and use separate mount points for persistence.

Leave Configuration Options at Defaults, Unless There Is a Specific Need

The default settings of Terracotta are the result of years of testing and experience in supporting customer installations of any given size.

Software AG strongly recommends not to "proactively" override default property settings unless a need is directly encountered.

Ensure Proper Selection of Persistence and High Availability Settings

Depending upon your use case, you may likely have requirements for taking extra care to make proper selections for relevant configurations such as:

- Deploying mirror servers
- Selecting a proper Failover Tuning priority
- Using persistence
- Regular backup processes

Software AG strongly recommends checking the relevant documentation sections in order to properly understand the concepts and implications.

Safe Shutdowns and Restarts

When shutting down Terracotta servers, and when restarting them, ensure that you follow the documented "Safe Cluster Shutdown and Restart Procedures". Under some configurations and situations failure to do so may result in data loss.

Ensure that the persons who are responsible for the operations of your system are familiar with these topics.