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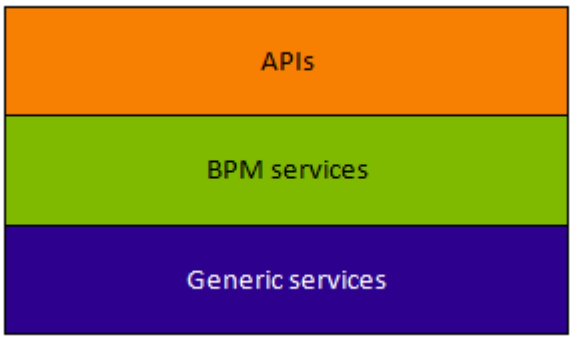
Bonita BPM Engine architecture

Product version:
6.3
Product edition:

- Community
- Teamwork
- Efficiency
- Performance

This page describes the Bonita BPM Engine. It includes information about APIs, BPM services , generic services, and packaging.

The Bonita BPM Engine is the runtime processor at the core of Bonita BPM. It executes processes, handling actions related to tasks, such as database access, and housekeeping actions such as logging. The Engine is composed of a number of services and APIs. The services are either BPM services or generic services.



The Bonita BPM Engine component services are completely configurable using an XML file called `bonita-server.properties`, which is located in the server configuration folder `conf\bonita\server\default\conf\`. This configuration file describes all the available services used by default. It is possible to change a service or replace it with a different implementation. In addition to the standard services, Bonitasoft will support a system that uses any services we provide. Certain services are available only for the Performance, Efficiency, and Teamwork editions. The editions also includes contributions that enhance some services. There are also some internal services that are used within the Engine but are not described here.

Services are served to the Engine using a ServiceAccessor. By default, this uses Spring to bind services and to retrieve services instances. The Spring configuration files are stored in ***BONITA_HOME***, and can be modified to change the implementation of a service or to tailor it.

The Engine can be installed on a Java Virtual Machine (JVM), in any web/JEE container, or can be used as a simple Java library.

APIs

This section contains a summary of the Bonita BPM Engine APIs. For details of the APIs, the methods and related objects, see the Javadoc.

Identity API	Manages information about an organization, that is, the set of users who can act in processes. Handles creation, modification, and deletion of organizations, groups, roles, memberships, and users.
Organization API	Import or export an organization.
Process API	Handles actions related to processes (deploy, enable, start, disable, delete), executes activities, updates process data, search for a retrieve process entities.
Login API	Logs in to the engine in a platform and creates a session.
Monitoring API	Retrieves information about current activity, such as the number of users logged in, or the number of processes currently being executed.
Log API	provides access to business logs, for searching and to retrieve information about current or archived processes.
Platform command API	Creates, starts, stops platform.
Document API	Manages documents that are attached to a process instance.
Theme API	Manages the Look & Feel of the Bonita BPM Portal web and mobile interfaces and forms.
Tenant Management API	Used to pause service in a tenant for maintenance, to resume service, and to check whether a tenant is paused. Available in Teamwork, Efficiency, and Performance editions.

There is also a Web API, which is for internal use only, and a Command API, which is primarily for internal use.

BPM services

BPM services are related to BPM activities.

Actor mapping

Description:	Manage mapping between actors and users, roles, and groups.

Used by:	-
Implementation:	org.bonitasoft.engine.actor.mapping.impl.ActorMappingServiceImpl

Category

Description:	Manage categories of processes. A category is a way to classify processes. Categories are handled manually by administrators in Bonita BPM Portal and are visible to portal users.
Used by:	Command service
Implementation:	org.bonitasoft.engine.core.category.impl.CategoryServiceImpl
Notes:	Store categories with the persistence service

Connector

Description:	Execute a connector using the ConnectorDefinition: get the connector from the file system, evaluate expressions of input parameters, instantiate/execute the connector and then execute output operations.
Used by:	Command service
Implementation:	org.bonitasoft.engine.core.connector.impl.ConnectorServiceImpl

Expression resolver

Description:	Evaluate expressions and the associated dependencies. The expression resolver default implementation take all expressions and dependencies, flattens them and orders them by type. It then evaluate all expressions starting with expressions that are known to have no dependencies. All expressions that are evaluated at the same time have the same context of evaluation.
Used by:	Any service that evaluates expressions
Implementation:	org.bonitasoft.engine.core.expression.control.api.impl.ExpressionResolverServiceImp

Login

Description:	Log in to or out of the Engine.
Used by:	APIs
Implementation:	org.bonitasoft.engine.core.login.LoginServiceImpl

Platform login

Description:	Log in to or out of the Engine at the platform level.
Used by:	APIs
Implementation:	org.bonitasoft.engine.core.platform.login.impl.PlatformLoginServiceImpl

Operation

Description:	Execute operations that update data. The Operation service can use different types of update method. The default methods, called Operators, are ASSIGNMENT, JAVA_METHOD, and XPATH_UPDATE_QUERY.

Used by:	Engine service, APIs when updating data using an operation
Implementation:	org.bonitasoft.engine.core.operation.impl.OperationServiceImpl

Parameter

Description:	For the Performance, Efficiency, and Teamwork editions, manage parameters of a process. Parameters are set for the scope of a process definition and are designed to be used as global configuration of a process, for example, you could store the URL of a database you use in some connectors.
Used by:	Engine, APIs, ExpressionService (using the contributed evaluator) when reading and updating parameters
Implementation:	org.bonitasoft.engine.parameter.propertyfile.PropertyFileParameterService
Notes:	Relies on Java properties in a file to store and retrieve parameters

Process comment

Description:	Create, update, get, list, or delete comments attached to a process instance.
Used by:	APIs
Implementation:	org.bonitasoft.engine.core.process.comment.api.impl.SCommentServiceImpl
Notes:	Relies on persistence service to store comments

Process definition

Description:	Handle process definition objects.
Used by:	Engine
Implementation:	org.bonitasoft.engine.core.process.definition.ProcessDefinitionServiceImpl
Notes:	Stores definition in file system and in cache using XML

Process document

Description:	Handle documents of a process. A ProcessDocument object contains all metadata of the document and the reference to the document content in the DocumentService.
Used by:	Engine, APIs when retrieving documents
Implementation:	org.bonitasoft.engine.core.process.document.api.impl.ProcessDocumentServiceImpl
Notes:	Stores process document metadata using the persistence service and stores document content using the document service

Engine

Description:	Handles process execution.

Used by:	APIs when executing processes or activities
Implementation:	the Engine itself

Process instance

Description:	Handle process instance objects.
Used by:	Engine
Implementation:	org.bonitasoft.engine.core.process.instance.impl.ProcessInstanceServiceImpl
Notes:	Relies on the persistence service to store objects

Supervisor mapping

Description:	Define the mapping between a process definition and the user who supervises it.
Used by:	APIs
Implementation:	org.bonitasoft.engine.supervisor.mapping.impl.SupervisorMappingServiceImpl

User filter

Description:	Read and execute a userfilter that filters the set of users eligible to carry out a pending task.
Used by:	Engine
Implementation:	org.bonitasoft.engine.core.filter.impl.UserFilterServiceImpl
Notes:	Uses the cache and read user filter of the file system

Generic services

Generic services perform actions that are not related to BPM but arerequired for successful process execution. No generic service has a dependencyon a BPM service.

Archive

Description:	Store and retrieve objects that will no longer change. For example, a process instance that is finished is archived using this service.
Used by:	ProcessInstance service to store ArchivedProcessInstance objects
Implementation:	org.bonitasoft.engine.archive.impl.ArchiveServiceImpl

Authentication

Description:	Check user credentials using a map.
Used by:	Login service in Bonita BPM Teamwork, Efficiency, and Performance editions

Implementation:	org.bonitasoft.engine.authentication.impl.GenericAuthenticationServiceImpl
Notes:	Uses the Identity service to check user credentials

Querieable logs

Description:	Log information related to business actions. For example, ?Activity 'step1' was created with id = 12? or ?Connector email-1.0.0 was succesfully executed on activity 1547?. By default, log information is stored in a database for easy query.
Used by:	Any service storing objects: ?deleted activity[..]? Scheduler service: ?Job executed [...]?
Implementations:	org.bonitasoft.engine.services.impl.SyncBusinessLoggerServiceImpl (Community edition: insert logs directly in database) org.bonitasoft.engine.log.api.impl.BatchBusinessLoggerImpl (Teamwork, Efficiency, and Performance editions: inserts all logs in batch at the end of the transaction)

Tenant cache

Description:	Store objects in the cache, and retrieve them. The service handles different caches that can be configured separately.
Used by:	ProcessDefinition service, Connector service, Expression service: put reusable definition objects in cache
Implementation:	org.bonitasoft.engine.cache.ehcache.EhCacheCacheService
Notes:	Uses EhCache to cache objects

Platform cache

Description:	Store objects in the cache, and retrieve them. The service handles different caches that can be configured separately.
Used by:	ProcessDefinition service, Connector service, Expression service: put reusable definition objects in cache
Implementation:	org.bonitasoft.engine.cache.ehcache.PlatformEhCacheCacheService
Notes:	Uses EhCache to cache objects

ClassLoader

Description:	An abstraction layer of the classloader, making it easy to change the classloader implementation at runtime. There is a hierarchy of classloaders, with a platform classloader handling items used by the whole platform, and a process classloader for items specify to a process. Each classloader is identitfied by a type and an Id.
Used by:	Server APIs, to create and set the classloader at platform level. Engine, to handle classloader of type process

Implementation:	org.bonitasoft.engine.classloader.ClassLoaderServiceImpl
Notes:	Relies on the dependency service to load the jar put in dependencies for a specific classloader

Platform command

Description:	Register and execute platform commands. Commands are Java classes that can be executed by the engine using the API. Using this service you can create your own code to be put server side and call it from a client.
Used by:	API to execute platform-level commands
Implementation:	org.bonitasoft.engine.platform.command.impl.PlatformCommandServiceImpl
Notes:	Uses persistence service to store commands

Connector executor

Description:	Execute a connector: take the instantiated Connector object, set its parameters, and execute it.
Used by:	Connector service, to execute the instantiated connector
Implementation:	org.bonitasoft.engine.connector.impl.ConnectorExecutorImpl

Data

Description:	Handle DataSource objects, which describe how to retrieve and store data on an internal or external system. The Engine contains two default implementations: org.bonitasoft.engine.data.instance.DataInstanceDataSourceImpl, which handles data stored in database, and org.bonitasoft.engine.core.data.instance.impl.TransientDataInstanceDataSource, which handles data stored in memory.
Used by:	DataInstance service, to get the data source of a data definition to get its value
Implementation:	org.bonitasoft.engine.data.DataServiceImpl

DataInstance

Description:	Handle data instance objects. A data instance is a variable that has a name, a type, and a value. This service also handles expressions of type VARIABLE_TYPE. A VARIABLE_TYPE expression references a data instance. When an expression is evaluated, the value of the data instance is returned.
Used by:	Process API, Process executor, all services that access data
Implementation:	org.bonitasoft.engine.data.DataInstanceServiceImpl
Notes:	Uses the persistence service to store data instances

Dependency

Description:	Declare Java dependencies on business objects. These dependencies have a name and a content that is the JAR itself. For example, a process that uses an email connector has a dependency on javamail.jar that is declared at deployment.
Used by:	Engine, to declare process dependencies ClassloaderService, to retrieve dependencies of process
Implementation:	org.bonitasoft.engine.dependency.impl.DependencyServiceImpl
Notes:	Dependency information is stored in database

Platform dependency

Description:	Declare dependencies between entities that are related to the platform, for example, platform commands declare platform dependencies.
Used by:	Platform Command service, to declare dependency of platform commands
Implementation:	org.bonitasoft.engine.dependency.impl.PlatformDependencyServiceImpl
Notes:	Dependency information is stored in database

Document

Description:	Store content of a document using an identifier. This service does not handle metadata of a document, just the content. The service sets an id on the document object given to it.
Used by:	ProcessDocumentService, to store the content of a process document
Implementation:	org.bonitasoft.engine.document.impl.DocumentServiceImpl
Notes:	Document object is stored in database

Expression

Description:	Evaluate an expression using the evaluator provided by another service (but do not evaluate dependencies of the expression). This service is extended by evaluators specific to the kind of expression to be evaluated. For example, in the Performance, Efficiency, and Teamwork editions, the ParameterService contributes an evaluator to evaluate expressions that reference a parameter. To add a new kind of expression, contribute a class implementing org.bonitasoft.engine.expression.ExpressionExecutorStrategy to the ExpressionExecutorStrategy class.
Used by:	ExpressionResolverService. to evaluate an expression and its dependencies
Implementation:	org.bonitasoft.engine.expression.impl.ExpressionServiceImpl

Identity

Description:	Handle information about elements of an organization (users, groups, roles, memberships).
Used by:	ProcessExecutor, to resolve actor mappings.
Implementation:	org.bonitasoft.engine.identity.impl.IdentityServiceImpl

Incident

Description:	Service that reports incidents to an administrator. An incident is an error that cannot be handled by the engine. The default impolementation log is a file named "Incidents.log" inside the tenant folder.
Used by:	Mainly by the work service.
Implementation:	org.bonitasoft.engine.incident.IncidentServiceImpl

Job

Description:	Handle and trace execution of internal jobs of the engine. A job is an internal action that can be triggered once or several times. (e.g. Timers are implemented using jobs.)
Used by:	Scheduler service.
Implementation:	org.bonitasoft.engine.scheduler.impl.JobServiceImpl,

Lock

Description:	Enable synchronization of code execution. The service enables creation of shared locks and exclusive locks. If a shared lock is taken out, other shared locks can also be taken out. If an exclusive lock is taken out, it blocks execution until the lock is released.
Used by:	ProcessExecutor, for canceling a process or for merging execution of branches
Implementation:	org.bonitasoft.engine.lock.impl.MemoryLockService
Notes:	Uses java.util.concurrent.locks.ReentrantReadWriteLock objects that are in memory only

Monitoring

Description:	Monitor Engine activity, such as active transactions, active users, or JVM status.
Used by:	API
Implementation:	org.bonitasoft.engine.monitoring.impl.MonitoringServiceImpl

Tenant Monitoring

Description:	Provide metrics on a tenant.

Used by:	API
Implementation:	com.bonitasoft.engine.monitoring.impl.TenantMonitoringServiceImpl

Platform Monitoring

Description:	Provide metrics on a platform.
Used by:	API
Implementation:	com.bonitasoft.engine.monitoring.impl.PlatformMonitoringServiceImpl

Persistence

Description:	Handle storage of objects in a persistent medium. There are two services, bonita-persistence-read for reading objects and bonita-persistence-api for reading and writing objects. The default implementation stores objects in the database, but the service could be implemented for any other type of persistent storage. The persistence service gives a unique identifier to an object.
Used by:	All services reading persistent objects (such as processInstanceService) use bonita-persistence-read. All services creating or modifying objects use bonita-persistence-api.
Implementation:	Hibernate

Platform

Description:	Handle creation, activation, and deletion of platform. The platform is the foundation of the Engine: creating the platform means creating database tables that are used by the Engine.
Used by:	-
Implementation:	org.bonitasoft.engine.platform.impl.PlatformServiceImpl
Notes:	Uses the persistence service to create platform.

Profile

Description:	Handle profiles. A profile is an entity with a name, description, and icon path that is associated with a user, group, role, or membership. A profile entity is used by Bonita BPM Portal to determine a user's profile (user, team manager, process owner, or administrator).
Used by:	API, used by Bonita BPM Portal to modify user profiles.
Implementation:	org.bonitasoft.engine.profile.impl.ProfileServiceImpl
Notes:	Uses persistence service to store privileges

Recorder

Description:	A layer between the persistence service and all services that need to store objects. It ensures that events are triggered and that queriable log entries are written.

Used by:	All services storing objects. For example, the ProcessInstanceService stores a ProcessInstanceObject using the recorder
Implementation:	org.bonitasoft.engine.recorder.impl.RecorderImpl

Reporting

Description:	Handle storage, retrieval, and update of reports.
Used by:	API
Implementation:	com.bonitasoft.engine.core.reporting.ReportingServiceImpl

Scheduler

Description:	Handle jobs and ensure that they are executed at the required time. There are three kinds of trigger: OneShotTrigger to execute a job once only at a given time, RepeatTrigger to execute a job a finite number of times at a given interval, and CronTrigger to execute a job according to a Unix-type structure.
Used by:	ProcessEngine, for timers and for launching the job that matches a message event
Implementation:	QuartzSchedulerService, org.bonitasoft.engine.scheduler.impl.SchedulerServiceImpl
Notes:	Relies on Quartz to launch jobs

Session

Description:	Handle user sessions. A session is an object stored in memory that contains several kinds of information about the client that uses it, for example, userId, ClientIp, ExpirationDate.
Used by:	LoginService,SchedulerService,WorkService to create sessions
Implementation:	org.bonitasoft.engine.session.impl.SessionServiceImpl

Platform session

Description:	Handle platform sessions. These sessions are created when something logs in to the platform.
Used by:	PlatformLoginService
Implementation:	org.bonitasoft.engine.platform.session.impl.PlatformSessionServiceImpl

Theme

Description:	Handle storage, retrieval, and update of portal themes.
Used by:	API.
Implementation:	org.bonitasoft.engine.theme.impl.ThemeServiceImpl

Transaction

Description:	Handles business transactions. A business transaction is a high-level transaction that contains several technical transactions. This service is copatible with JTA.
Used by:	Almost all services, including persistence service to register technical transactions.
Implementation:	org.bonitasoft.engine.transaction.TransactionServiceImpl

Technical logger

Description:	An abstraction layer used to access the logger implementation. Clients of this service can log information using different levels: TRACE, DEBUG, INFO, WARNING, ERROR.
Used by:	All services that log information in the technical log.
Implementation:	TechnicalLoggerSLF4JImpl
Notes:	Implementation based on SLF4J

Work

Description:	Trigger work for immediate execution but asynchronously. Unlike the scheduler service, which uses persistent storage, the Work service stores data in memory for better performance. This means that clients of the service must handle restart if a triggered work does not complete. For example, if the JVM shuts down, when it restarts the client must check for incomplete work and re-trigger it.
Used by:	ProcessExecutor, to trigger work to execute flow elements one after another
Implementation:	org.bonitasoft.engine.work.ExecutorWorkService
Notes:	Trigger launches work in a ThreadPool. For Community Edition, work items are launched in sequence, each one in a new thread. For Teamwork, Efficiency, and Performance Editions, work items are triggered in multiple threads.

XML

Description:	Parse and write XML files.
Used by:	BusinessArchiveBuilder, to read/write process definitions ConnectorService, to read connector definition
Implementations:	org.bonitasoft.engine.xml.parse.SAXParser (parse using sax) org.bonitasoft.engine.xml.SAXValidator (validate using sax) org.bonitasoft.engine.xml.DOMWriter (write using DOM)

Packaging

The Engine is provided as three .jar files:

- bonita-common contains code that is used by both the server and client sides of the application. For example, the API interface is accessed both on the server side, which contains the API implementations, and on the client side, which has a proxy on the API. It also contains objects such as BusinessArchive, which is the JavaObject representation of a .bar file.
- bonita-server contains code used on by the server. For example, it contains service implementations, the services accessor, and API implementations.
- bonita-client contains client-only code. For example, it contains the Accessor service for the APIs, which is not in the common or server packages to prevent the server code calling the client-side API accessor.

In the Performance, Efficiency, and Teamwork editions, these jar files are bonita-common-sp.jar, bonita-server-sp.jar, and bonita-client-sp.jar.
