D4.1a - VISHNU Tasks Management Service Package Design

COLLABORATORS

	TITLE : D4.1a - VISHNU Tasks Management Service Package Design	

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Chapter 1

Document presentation

1.1 Document objectives

This document presents the detailed internal design of the Tasks Management Service (TMS) package. The purpose of this package is to handle all aspects of Tasks Management Service within the VISHNU system. The functional and non-functional requirements for this package are those described in the referenced specification documents. The current document is part of the design phase of the software and therefore its main goal is to define the main components of the system architecture and their relationships.

1.2 Document structure

- Chapter 1 contains a brief overview of the document content.
- Chapter 2 contains a high-level overview of the system architecture except the TMS deployment diagram which is described in the delivrable D1.1g (VISHNU Technical Architecture).
- Chapter 3 describes the internal API used for remote procedure calls through SysFera-DS.
- Chapter 4 describes the internal class and data structures except the Vishnu core functions modelization which is described in the delivrable D2.1a (VISHNU User Mangement Service Package Design)

1.3 References

- [D1.1a]: VISHNU General specifications
- [D1.1b]: VISHNU Spécifications techniques des besoins
- [D1.1c]: VISHNU API Detailed specifications
- [D1.1g]: VISHNU Technical Architecture
- [D2.1a]: VISHNU User Management Service Package Design

1.4 Acronyms

- **API**: Application programming interface
- **CLI**: Command line interface

- **DB**: DataBase
- **n/a**: Not Appliable (used for serializable capability in function descriptions)
- **SeD**: A Server Daemon is a SysFera-DS agent that provides services through the SysFera-DS API.
- **TMS**: Tasks management service
- **WS**: Web services
- **LL**: LoadLeveler

1.5 Glossary

- **Components**: the software components represents a library or an executable program that provides a given interface to other components or to end-users.
- **Serialized type**: this is a class of data (C++ Class) which instances can be serialized in a XML string before being sent over an API (to or from the API). The data is deserialized on the other side of the channel in order to re-build the same instance of the class.
- **SysFera-DS**: open-source middleware developped by SysFera.

Chapter 2

System Architecture

2.1 Overview of the TMS software infrastructure

We present in this section a detailed description of the TMS package architecture in terms of software components. In addition we show the dependencies between components to highlight their reuse. These components follow a client/server model. We present the different software layers from services (provided directly to the user) to the database (used by the server). The TMS client server package has been split into eight different interrelated components. The diagrams shown in section 2.3 describe the relationships between these components. The definitions of the components are the following:

- **External API** contains precisely the services provided to the user as defined in the detailed specifications. We're on the client side.
- **Internal API** is the middle layer of the server side. The services announced previously are performed here by combining a set of classes defined in the two following components.
- **TMS Client** contains intermediate (proxy) classes providing remote access to the business objects of **TMS Server**.
- **TMS Server** contains all classes implementing business objects by encapsulating the processing provided through the internal API.
- **Sysfera-DS Client API** is the C++ client API provided by the SysFera-DS toolbox.
- **Sysfera-DS Server API** is the C++ server API provided by the SysFera-DS toolbox.
- **Torque API** : is the C API provided by the Torque batch scheduler.
- **LoadLeveler API** : is the C API provided by the LoadLeveler batch scheduler..
- **Vishnu Database** stores all data manipulated by the TMS Server.

2.2 Architecture diagrams

2.2.1 TMS client-side components

This diagram shows the TMS client side components. Two services among all the services of the TMS external API (see ref. D1.1c) are shown here for example. These services are consumed by serval user interfaces: command-line, web services and python. All the interfaces of the TMS Client component are shown.

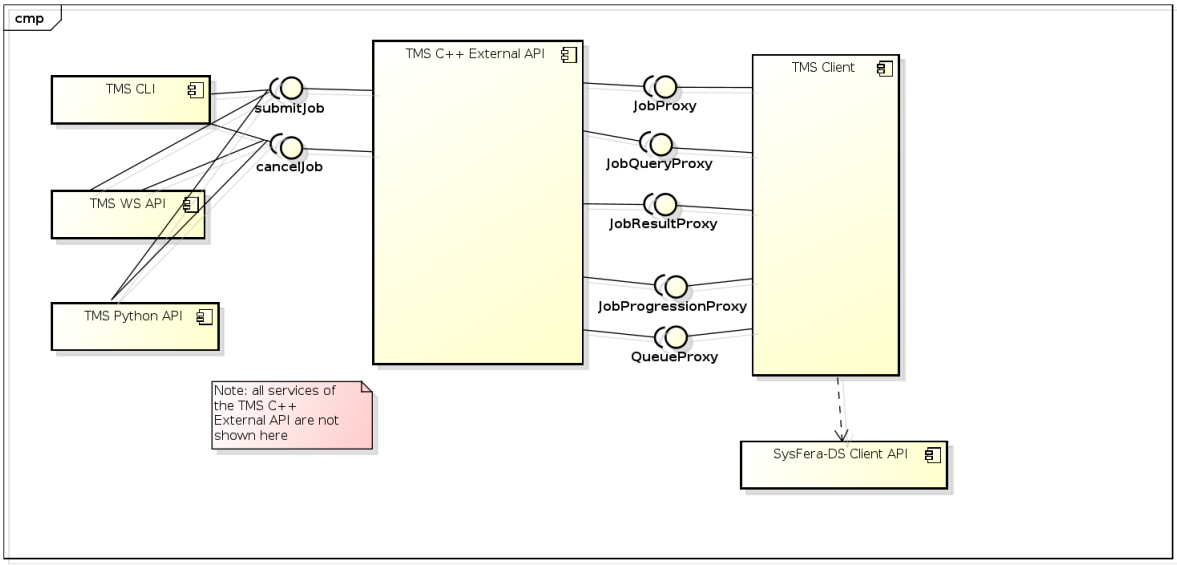

Figure 2.1: TMS client-side components

2.2.2 TMS server-side components

This diagram highlights the TMS server side components. Two services among all the services of the TMS internal API are shown here for example. These services are consumed by the TMS Client component through the SysFera-DS API. All the interfaces of the TMS Server component are shown. The TMS Server component uses the Torque and LoadLeveler API as underlying batch sheduler.

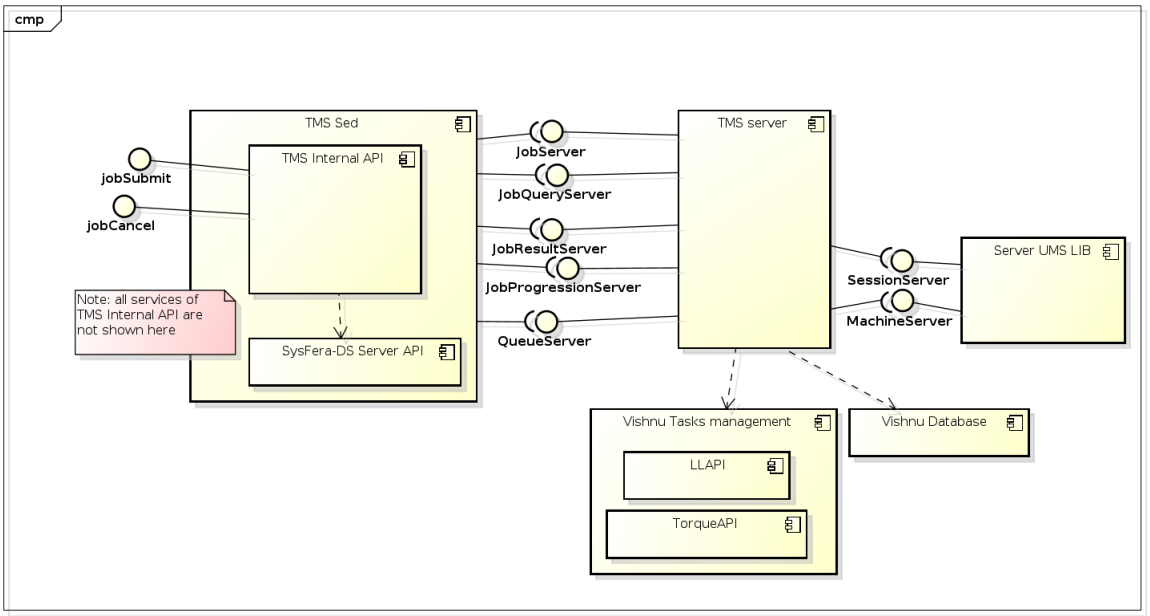

Figure 2.2: TMS server-side components

2.2.3 SysFera-DS Bus Details

This diagram shows the communication paths between the Client host and the TMS servers using the SysFera-DS Bus. On each remote VISHNU machine on which a batch scheduler library and API are installed a TMS server must be launched (for example in the figure 2.3 we have three TMS servers launched on three different nodes). The SysFera-DS MasterAgent is a SysFera-DS agent that can be executed on a dedicated host or on the same host as the TMS Server. All the communications between the entities here are done using the CORBA IIOP (Internet Inter-ORB) protocol and the communications can be tunneled through SSH tunnels if necessary. The MasterAgent entity is involved in the choice of one TMS Server in the case of several available TMS servers. The diagram shows here all the communication paths in the case where the TMS Server2 is chosen by the MasterAgent.

Note: each TMS server is associated to an unique owner (we called this owner vishnu_global_owner). All vishnu jobs will be submitted with the name of this global owner through LoadLeveler or Torque API. After each job submission the vishnu TMS transforms the returned API job identifier to a correspondant Vishnu job identifier and transforms the vishnu_global_owner to the name of the user who has submitted the job.

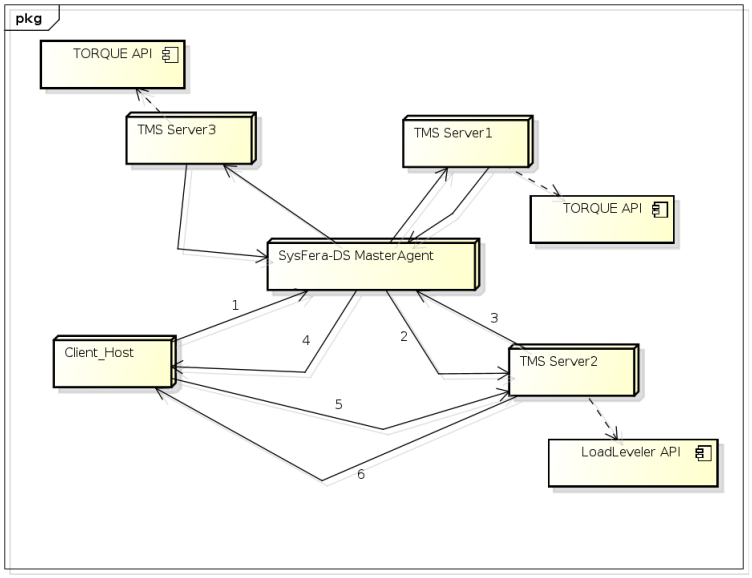

Figure 2.3: SysFera-DS Bus Details

Chapter 3

Internal API specification

3.1 Generic definition formats presentation

This section presents the formats used in this chapter to describe the services provided by the internal API.

3.1.1 Service definition format

Access

Here is detailed the access level of the service 'myService' (i.e. the privilege required to use it)

Parameters

The following table contains all the input and output parameters of the service, along with their type and description.

Parameter	Type	Serialized type	Description	Mode
sessionKey	string	n/a	This is an example of a required string input parameter	IN
listOfJobs	string	ListJobs	This is an example of an object output parameter that is serialized as a string	OUT

Description

Here is detailed the purpose of the service 'myService'

Return Value

Here are detailed the different return codes provided by the service.

Name	Description
ERRCODE_VISHNU_OK	The service has been performed successfully.
ERRCODE_UNKNOWN_MACHINE	This is the human-readable generic message that will be available to the user of the API.

Used by this(these) API function(s):

This shows the list of functions from the external Vishnu API (see [D1_1c]) that use this service.

3.2 Definition of the services of the package

3.2.1 Service jobSubmit

Access

This service can be used by any VISHNU user

Parameters

Parameter	Type	Serialized type	Description	Mode
sessionKey	string	n/a	The session key is the encrypted identifier of the session generated by VISHNU	IN
machineId	string	n/a	Is the id of the machine on which the job must be submitted	IN
options	string	SubmitOptions	Is an instance of the class SubmitOptions. It allows the user to submit job by using different options	IN
job	string	Job	The Job object containing the input information (ex: scriptPath) and output information (ex: jobId) of the job to submit	INOUT
errorInfo	string	n/a	Additional information provided when an error code is returned	OUT

Description

The jobSubmit() function submits job on a machine through the use of a script (scriptFilePath).

Return Value

An error code is returned when an error occurs during the execution of the service

Name	Description
ERRCODE_VISHNU_OK	The service was performed successfully
ERRCODE_UNKNOWN_MACHINE	The machine is not known
ERRCODE_BATCH_SCHEDULER_ERROR	Indicates an error caused by the underlying batch scheduler
ERRCODE_INVALID_PARAMETER	The provided parameter is invalid
ERRCODE_SESSION_KEY_NOT_FOUND	The sessionKey is unrecognized
ERRCODE_UNKNOWN_BATCH_SCHEDULER	Indicates that the batch scheduler type is not known
ERRCODE_UNKNOWN_QUEUE	Indicates that the specified queue by the user is not known
DB_ERROR	A problem occurs with the database
ERRCODE_UNKNOWN_ERROR	The type of error is not known

Used by this(these) API function(s):

TMS::submitJob

3.2.2 Service jobCancel

Access

This service can be used by any VISHNU user

Parameters

Parameter	Type	Serialized type	Description	Mode
sessionKey	string	n/a	The session key is the encrypted identifier of the session generated by VISHNU	IN
machineId	string	n/a	Is the id of the machine on which the job is running	IN

Parameter	Type	Serialized type	Description	Mode
job	string	Job	The Job object containing the input information (ex: jobId)	IN
errorInfo	string	n/a	Additional information provided when an error code is returned	OUT

Description

The jobCancel() function cancels a job from its id

Return Value

An error code is returned when an error occurs during the execution of the service

Name	Description
ERRCODE_VISHNU_OK	The service was performed successfully
ERRCODE_UNKNOWN_MACHINE	The machine is not known
ERRCODE_SESSIONKEY_EXPIRED	The sessionKey has expired. The session is closed.
ERRCODE_SESSION_KEY_NOT_FOUND	The sessionKey is unrecognized
ERRCODE_BATCH_SCHEDULER_ERROR	Indicates an error caused by the underlying batch scheduler
ERRCODE_INVALID_PARAMETER	The provided parameter is invalid
ERRCODE_CAN_NOT_CANCEL	Can not cancel this job
ERRCODE_PERMISSION_DENIED	Indicates the requested operation is not allowed for provided user
DB_ERROR	A problem occurs with the database

Used by this(these) API function(s):

TMS::cancelJob

3.2.3 Service jobQueryGetInfoOfJob

Access

This service can be used by any VISHNU user

Parameters

Parameter	Type	Serialized type	Description	Mode
sessionKey	string	n/a	The session key is the encrypted identifier of the session generated by VISHNU	IN
machineId	string	n/a	Is the id of the machine on which the job is running	IN
job	string	Job	The Job object containing the input information (ex: jobId) and the resulting information	INOUT
errorInfo	string	n/a	Additional information provided when an error code is returned	OUT

Description

The jobQueryGetInfoOfJob() function gets information on a job from its id

Return Value

An error code is returned when an error occurs during the execution of the service

Name	Description
ERRCODE_VISHNU_OK	The service was performed successfully
ERRCODE_SESSION_KEY_NOT_FOUND	The sessionKey is unrecognized

Name	Description
ERRCODE_SESSIONKEY_EXPIRED	The sessionKey has expired. The session is closed.
ERRCODE_INVALID_PARAMETER	The provided parameter is invalid
ERRCODE_UNKNOWN_MACHINE	The machine is not known
ERRCODE_UNKNOWN_BATCH_SCHEDULER	Indicates that the batch scheduler type is not known
DB_ERROR	A problem occurs with the database
ERRCODE_UNKNOWN_ERROR	The type of error is not known

Used by this(these) API function(s):

TMS::getJobInfo

3.2.4 Service jobQueryGetListOfJobs

Access

This service can be used by any VISHNU user

Parameters

Parameter	Type	Serialized type	Description	Mode
sessionKey	string	n/a	The session key is the encrypted identifier of the session generated by VISHNU	IN
machineId	string	n/a	Is the id of the machine on which the jobs are running	IN
options	string	ListJobsOptions	Additional options for jobs listing	IN
listOfJobs	string	ListJobs	The constructed object list of jobs	OUT
errorInfo	string	n/a	Additional information provided when an error code is returned	OUT

Description

The jobQueryGetListOfJobs() function gets a list of all submitted jobs

Return Value

An error code is returned when an error occurs during the execution of the service

Name	Description
ERRCODE_VISHNU_OK	The service was performed successfully
ERRCODE_SESSION_KEY_NOT_FOUND	The sessionKey is unrecognized
ERRCODE_SESSIONKEY_EXPIRED	The sessionKey has expired. The session is closed.
ERRCODE_INVALID_PARAMETER	The provided parameter is invalid
ERRCODE_UNKNOWN_MACHINE	The machine is not known
ERRCODE_UNKNOWN_BATCH_SCHEDULER	Indicates that the batch scheduler type is not known
ERRCODE_UNKNOWN_ERROR	The type of error is not known
DB_ERROR	A problem occurs with the database

Used by this(these) API function(s):

TMS::listJobs

3.2.5 Service jobResultGetOutPutOfJob

Access

This service can be used by any VISHNU user

Parameters

Parameter	Type	Serialized type	Description	Mode
sessionKey	string	n/a	The session key is the encrypted identifier of the session generated by VISHNU	IN
machineId	string	n/a	Is the id of the machine on which the jobs has been submitted	IN
job	string	Job	The Job object containing the input information (ex: jobId) and ouput information (ex: outputPath an errorPath)	OUT
errorInfo	string	n/a	Additional information provided when an error code is returned	OUT

Description

The jobResultGetOutPutOfJob() function gets outputPath and errorPath of a job from its id

Return Value

An error code is returned when an error occurs during the execution of the service

Name	Description
ERRCODE_VISHNU_OK	The service was performed successfully
ERRCODE_SESSION_KEY_NOT_FOUND	The sessionKey is unrecognized
ERRCODE_SESSIONKEY_EXPIRED	The sessionKey has expired. The session is closed.
ERRCODE_INVALID_PARAMETER	The provided parameter is invalid
ERRCODE_UNKNOWN_MACHINE	The machine is not known
ERRCODE_PERMISSION_DENIED	Indicates the requested operation is not allowed for provided user
ERRCODE_UNKNOWN_ERROR	The type of error is not known
DB_ERROR	A problem occurs with the database

Used by this(these) API function(s):

TMS::getJobOutPut

3.2.6 Service jobResultGetAllJobsOutPut

Access

This service can be used by any VISHNU user

Parameters

Parameter	Type	Serialized type	Description	Mode
sessionKey	string	n/a	The session key is the encrypted identifier of the session generated by VISHNU	IN
machineId	string	n/a	Is the id of the machine on which the jobs are been submitted	IN
listOfResults	string	ListJobResults	Is the list of jobs results	OUT
errorInfo	string	n/a	Additional information provided when an error code is returned	OUT

Description

The jobResultGetAllJobsOutPut() function dynamically gets outputPath and errorPath of completed jobs

Return Value

An error code is returned when an error occurs during the execution of the service

Name	Description
ERRCODE_VISHNU_OK	The service was performed successfully
ERRCODE_SESSION_KEY_NOT_FOUND	The sessionKey is unrecognized
ERRCODE_SESSIONKEY_EXPIRED	The sessionKey has expired. The session is closed.
ERRCODE_INVALID_PARAMETER	The provided parameter is invalid
ERRCODE_UNKNOWN_BATCH_SCHEDULER	Indicates that the batch scheduler type is not known
ERRCODE_UNKNOWN_ERROR	The type of error is not known
DB_ERROR	A problem occurs with the database

Used by this(these) API function(s):

TMS::getAllJobsOutPut

3.2.7 Service jobResultRefreshPeriodSet

Access

This service can be used by ADMIN users only

Parameters

Parameter	Type	Serialized type	Description	Mode
sessionKey	string	n/a	The Session object which contains the session input information (ex: the session key which is the encrypted identifier of the session generated by VISHNU)	IN
machineId	string	n/a	Is the id of the machine that the user wants to set refresh period	IN
value	string	n/a	Is the refresh interval value (in seconds)	IN
errorInfo	string	n/a	Additional information provided when an error code is returned	OUT

Description

The jobResultRefreshPeriodSet() function sets the refresh period of output and error files contents

Return Value

An error code is returned when an error occurs during the execution of the service

Name	Description
ERRCODE_VISHNU_OK	The service was performed successfully
ERRCODE_UNKNOWN_MACHINE	The machine is not known
ERRCODE_SESSION_KEY_NOT_FOUND	The sessionKey is unrecognized
ERRCODE_SESSIONKEY_EXPIRED	The sessionKey has expired. The session is closed.
ERRCODE_UNKNOWN_ERROR	The type of error is not known
ERRCODE_INVALID_PARAMETER	The provided parameter is invalid
DB_ERROR	A problem occurs with the database

Used by this(these) API function(s):

TMS::setMachineRefreshPeriod

3.2.8 Service jobProgressionGetResults

Access

This service can be used by any VISHNU user

Parameters

Parameter	Type	Serialized type	Description	Mode
sessionKey	string	n/a	The session key is the encrypted identifier of the session generated by VISHNU	IN
machineId	string	n/a	Is the id of the machine that the user wants to get jobs progression	IN
options	string	ProgressOptions	Is an object containing the available options jobs for progression .	IN
progress	string	Progression	Is the object containing jobs progression information	OUT
errorInfo	string	n/a	Additional information provided when an error code is returned	OUT

Description

The jobProgressionGetResults() function gets the progression status of jobs

Return Value

An error code is returned when an error occurs during the execution of the service

Name	Description
ERRCODE_VISHNU_OK	The service was performed successfully
ERRCODE_UNKNOWN_MACHINE	The machine is not known
ERRCODE_SESSION_KEY_NOT_FOUND	The sessionKey is unrecognized
ERRCODE_SESSIONKEY_EXPIRED	The sessionKey has expired. The session is closed.
ERRCODE_INVALID_PARAMETER	The provided parameter is invalid
ERRCODE_BATCH_SCHEDULER_ERROR	Indicates an error caused by the underlying batch scheduler
ERRCODE_UNKNOWN_ERROR	The type of error is not known
DB_ERROR	A problem occurs with the database

Used by this(these) API function(s):

TMS::getJobProgress

3.2.9 Service QueueList

Access

This service can be used by any VISHNU user

Parameters

Parameter	Type	Serialized type	Description	Mode
sessionKey	string	n/a	The session key is the encrypted identifier of the session generated by VISHNU	IN
machineId	string	n/a	Is the id of the machine that the user wants to list queues	IN
listofQueues	string	ListQueues	The list of queues	OUT
errorInfo	string	n/a	Additional information provided when an error code is returned	OUT

Description

The QueueList() function gets queues information

Return Value

An error code is returned when an error occurs during the execution of the service

Name	Description
ERRCODE_VISHNU_OK	The service was performed successfully

Name	Description
ERRCODE_INVALID_PARAMETER	The provided parameter is invalid
ERRCODE_UNKNOWN_MACHINE	The machine is not known
ERRCODE_SESSIONKEY_EXPIRED	The sessionKey has expired. The session is closed.
ERRCODE_SESSION_KEY_NOT_FOUND	The sessionKey is unrecognized
ERRCODE_BATCH_SCHEDULER_ERROR	Indicates an error caused by the underlying batch scheduler
DB_ERROR	A problem occurs with the database
ERRCODE_UNKNOWN_ERROR	The type of error is not known

Used by this(these) API function(s):

TMS::listQueues

Chapter 4

Internal class and data structures

4.1 Introduction

This chapter introduces the details of the implementation of the different components described in chapter 2 (Architecture). It is composed of three sections:

- **Client modelization**: describes the classes used to implement the *TMS Client* component.
- **Server modelization**: describes the classes used to implement the *TMS Server* component.
- **Data modelization**: describes the data structure used to implement the *TMS Client* component and the *TMS Server* component.

4.2 TMS client modelization

4.2.1 Class diagrams

4.2.1.1 TMS Client Class Diagram

This diagram describes all classes used to communicate with VISHNU System. Each class proxy contains the corresponding data class illustrated on the TMS Data modelization section and the methods usable by the TMS Client component.

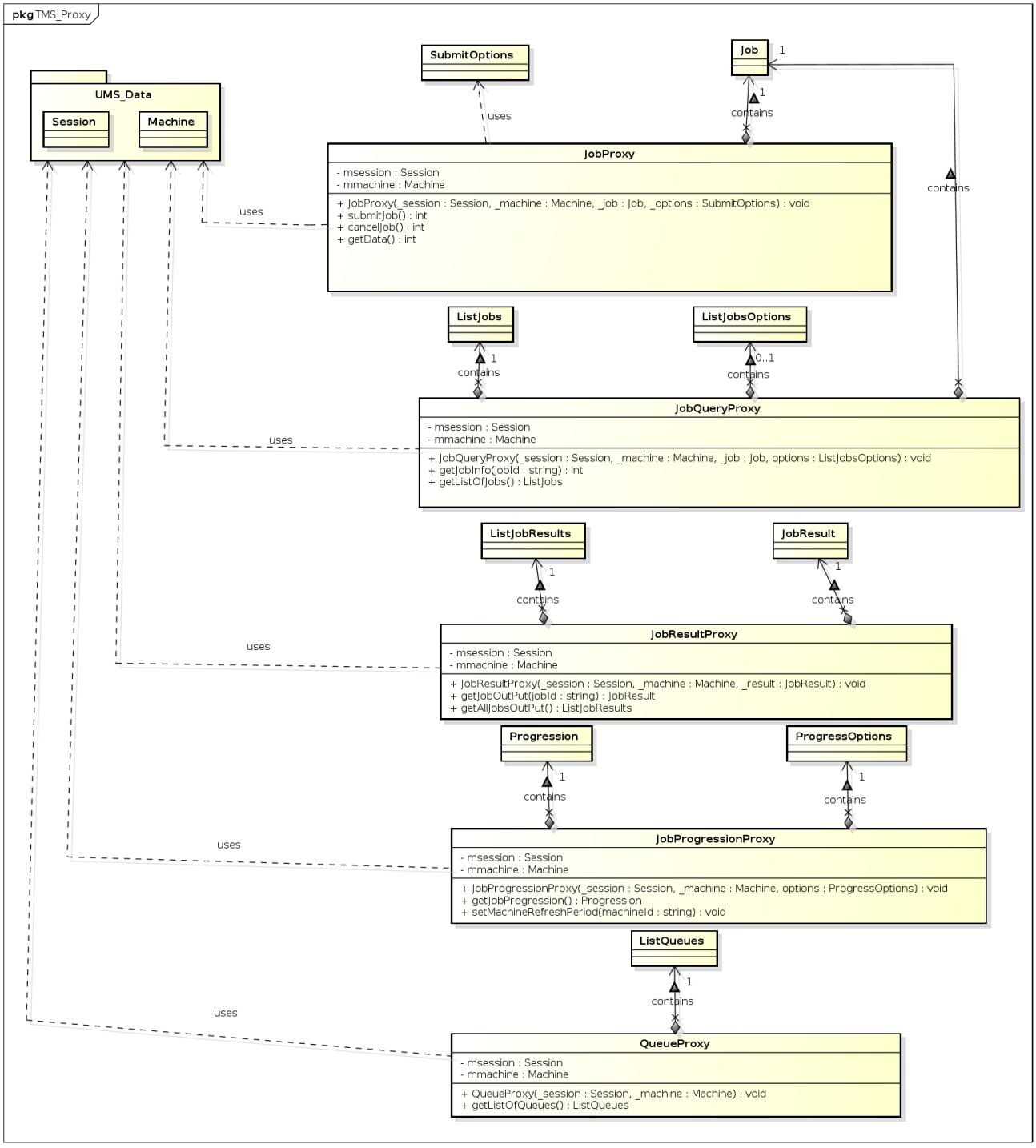

Figure 4.1: TMS Client Class Diagram

4.3 TMS server modelization

4.3.1 Class diagrams

4.3.1.1 TMS Server Class Diagram

This diagram presents the main objects used by TMS server component to process the TMS Client component requests.

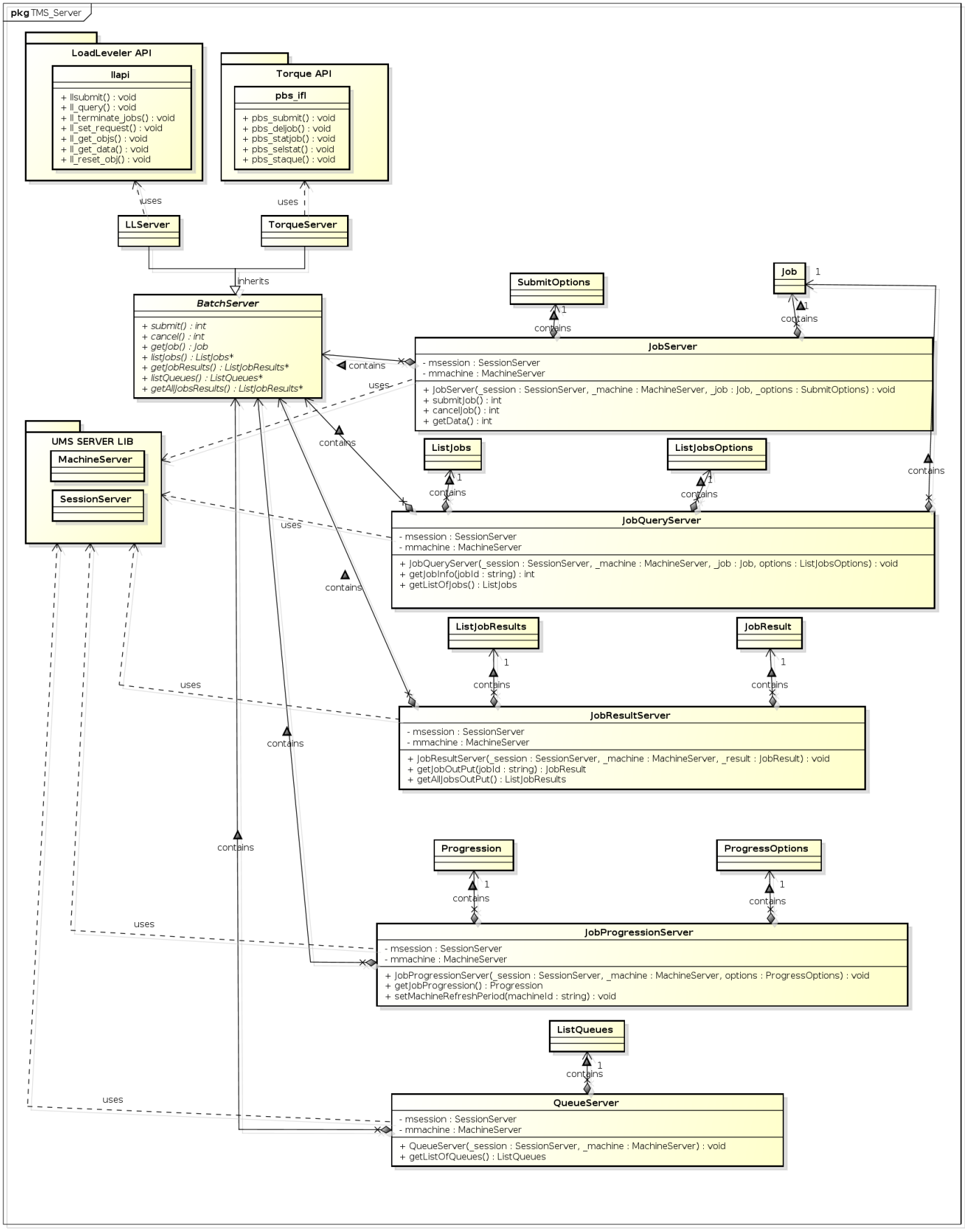

Figure 4.2: TMS Server Class Diagram

4.4 TMS data modelization

4.4.1 Class diagrams

4.4.1.1 TMS Data Class Diagram

This diagram illustrates the structure and the relationship between data manipulated by the components Client and Server.

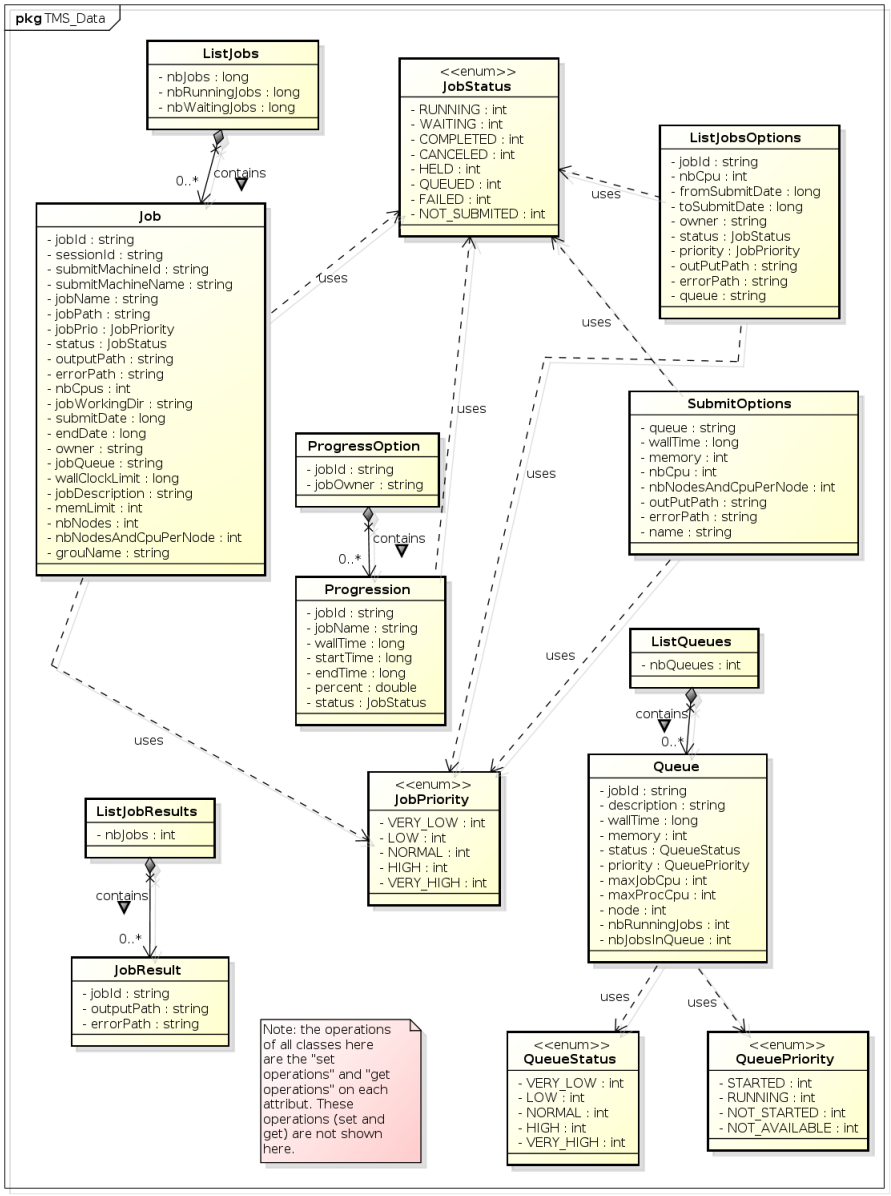

Figure 4.3: TMS Data Class Diagram