OVSA SPI for Service Providers

Equipment Connections Pools Developer Reference

Release v.5.1

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Support

Support for the HP Open View Service Activator SPI product is available on the following mailing list:

ovsa.spain.support@hp.com

In This Guide

This guide will explain the configuration, installation, needed development, and functionality provided by the ECP.

Audience

The audience for this guide is the Solutions Integrator (SI). The SI has a combination of some or all of the following capabilities:

Understands and has a solid working knowledge of:

- UNIX® commands
- Windows® system administration

Understands networking concepts and language

Is able to program in Java™ and XML

Understands security issues

Understands the customer's problem domain

Conventions

The following typographical conventions are used in this guide.

Font	What the Font Represents	Example
Italic	Book or manual titles, and man page names	Refer to the *HP Service Activator — Workflows and the Workflow Manager* and the *Javadocs* man page for more information.
	Provides emphasis	You *must* follow these steps.
	Specifies a variable that you must supply when entering a command	Run the command: `java -classpath` *<classpath>*
	Parameters to a method	The *assigned_criteria* parameter returns an ACSE response.
Bold	New terms	The **distinguishing attribute** of this class...
`Computer`	Text and items on the computer screen	The system replies: `Press Enter`
	Command names	Use the `java` command ...
	Method names	The `get_all_replies()` method does the following...
	File and directory names	Edit the file `$ACTIVATOR_ETC/config/mwfm.xml`
	Process names	Check to see if `mwfm` is running.
	Properties files keys names	Set the property `LOG_DIR` to establish the log files path.
	Window/dialog box names	In the `Test and Track` dialog...
	XML tag references	Use the `<DBTable>` tag to...
`Computer Bold`	Text that you must type	At the prompt, type: **`ls -l`**
Keycap	Keyboard keys	Press **Return**.
[Button]	Buttons on the user interface	Click `[Delete]`. Click the `[Apply]` button.
Menu Items	A menu name followed by a colon (:) means that you select the menu, then the item. When the item is followed by an arrow (->), a cascading menu follows	Select `Locate:Objects->by Comment`.

Install Location Descriptors

The following names are used throughout this guide to define install locations.

Descriptor	What the Descriptor Represents
$ACTIVATOR_OPT	The base install location of Service Activator. The UNIX location is /opt/OV/ServiceActivator The Windows location is <drive>:\HP\OpenView\ServiceActivator\
$ACTIVATOR_ETC	The install location of specific Service Activator configuration files. The UNIX location is /etc/opt/OV/ServiceActivator The Windows location is <drive>:\HP\OpenView\ServiceActivator\etc\
$ACTIVATOR_VAR	The install location of specific Service Activator logging files. The UNIX location is /var/opt/OV/ServiceActivator The Windows location is <drive>:\HP\OpenView\ServiceActivator\var\
$ACTIVATOR_BIN	The install location of specific Service Activator binary files. The UNIX location is /opt/OV/ServiceActivator/bin The Windows location is <drive>:\HP\OpenView\ServiceActivator\bin\
$ACTIVATOR_THIRD_PARTY	The location for new Java components such as workflow nodes and modules. Third-party libraries can also be placed in this directory. The UNIX location is /opt/OV/ServiceActivator/3rd-party The Windows location is <drive>:\HP\OpenView\ServiceActivator\3rd-party\ Customized inventory files are stored in the following locations: UNIX: $ACTIVATOR_THIRD_PARTY/inventory Windows: $ACTIVATOR_THIRD_PARTY\inventory
$JBOSS_HOME	HOME The install location for JBoss. The UNIX location is /opt/HP/jboss The Windows location is <drive>:\HP\jboss
$JBOSS_DEPLOY	The install location of the Service Activator J2EE components. The UNIX location is /opt/HP/jboss/server/default/deploy The Windows location is <drive>:\HP\jboss\server\default\deploy
$ACTIVATOR_DB_USER	The database user name you define.

	Suggestion: `ovactivator`
`$ACTIVATOR_SSH_USER`	The Secure Shell user name you define. Suggestion: `ovactusr`
`$SOSA_HOME`	The base install location of SOSA. The UNIX location is `/opt/OV/Sosa` The Windows location is <drive>:\HP\OpenView\Sosa\
`$SOSA_BIN`	The install location of specific SOSA binary files. The UNIX location is `/opt/OV/Sosa/bin` The Windows location is `<drive>:\HP\OpenView\Sosa\bin\`
`$SOSA_ETC`	The install location of specific SOSA configuration files. The UNIX location is `/opt/OV/Sosa/config` The Windows location is <drive>:\HP\OpenView\Sosa\config\
`$ECP_HOME`	The base install location of Equipment Connections Pool. The UNIX location is `/opt/OV/ECP` The Windows location is <drive>:\HP\OpenView\ECP\
`$ECP_BIN`	The install location of specific Equipment Connections Pool binary files. The UNIX location is `/opt/OV/ECP/bin` The Windows location is <drive>:\HP\OpenView\ECP\bin\
`$ECP_ETC`	The install location of specific Equipment Connections Pool configuration files. The UNIX location is `/opt/OV/ECP/conf` The Windows location is <drive>:\HP\OpenView\ECP\conf\
`$ECP_LIB`	The install location of specific Equipment Connections Pool jar files. The UNIX location is `/opt/OV/ECP/lib` The Windows location is <drive>:\HP\OpenView\ECP\lib\
`$ECP_LOG`	The install location of specific Equipment Connections Pool log files. The default UNIX location is `/opt/OV/ECP/log` The default Windows location is <drive>:\HP\OpenView\ECP\log\

1. Introduction

1.1. Purpose

This document is a manual for all ECP Module users. It gives a general view of the ECP Module concepts, functionality, architecture, and use, with special focus in configuration and its effects.

1.2. General Description

The function of the ECP Module, as part of the SPI, is automating user interactive textual sessions, via TCP/IP connections to networked devices, such as routers, switches, proxies, etc…

The ECP Module receives a textual representation of the session, which states the commands to issue, their output and their meanings, and the control flow logic (such as the conditions under which a command must be issued or how many times must be issued).

The ECP Module is the module in SPI which in the last instance directly connects to the SPI managed devices, centralizing the SPI management connections. This situation inside the SPI framework is ideal to perform task such as load balancing, high availability and resources use optimization when referring to management connections. Toward this objective, the ECP Module implements a series of connections Pools, which provide the aforementioned functionalities, grouped in a Pool Manager.

The ECP Module is divided in two elements, the ECP Client and the ECP Service (an RMI service). The ECP Service receives the representations of the sessions and actually executes them, and contains the Pool Manager. The ECP Client acts mainly as a proxy, easing access to the ECP Service. It also allows the user to totally bypass the ECP RMI Service if needed, being the process transparent to the user. Bypassing the ECP Service is known as “Direct Connection” as opposed to “Pooled Connections” when using the ECP RMI Service. The use of either method is transparent to the user.

Such division allows easier scalability of the SPI, while maintaining the ECP Module objectives of load balancing, high availability and resources use optimization.

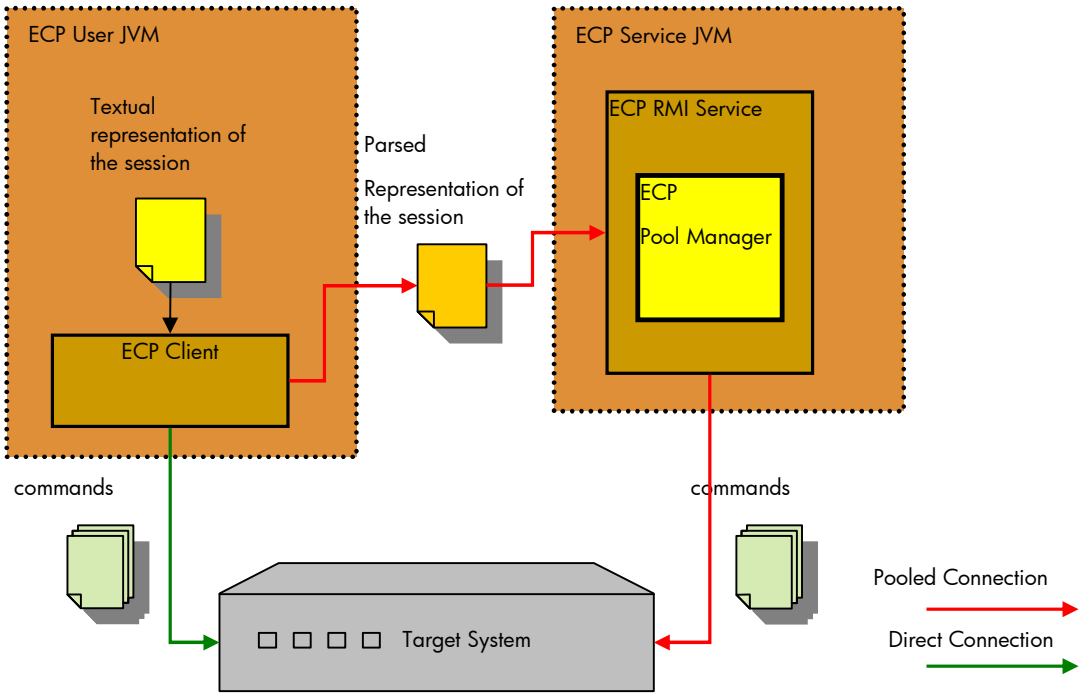


Figure 1: ECP Simplified General diagram.

1.3. ECP Module Entities and Concepts

1.3.1. Target System

In the context of the ECP, a "Target System" is the collection of resources accessible through a single direct TCP/IP Connection. Usually, a "Target System" will be a single router, switch or other similar device. However, more complex scenarios are possible if other devices are accessed from the connection end-point.

1.3.2. Operation

By "Operation" we refer to the collection of commands and logic needed to perform a certain process on the Target System. The purpose of the process may be a data inquiry, a configuration change or any other action needed on a Target System. An "Operation" should be atomic, that is, it should completely occur, or have no effects on the Target System. As a consequence, "Operations" should include the commands and logic needed to rollback the changes on the Target System if any. However, this policy is not enforced. Its use is left to the user's discretion.

1.3.3. Commands Template/Operation Template

A "Command Template" is a string which complies with a certain syntax through which an Operation is expressed, for the ECP Module to interpret and process it, usually with the purpose of automating a human interactive session on the Target System. The "Command Template" states the commands needed to perform the process (and usually to roll it back too), with specific information on every command, such

as possible command outputs and their meaning (error, success) and the control flow which determines their execution order, among other things.

1.3.4. Operation Execution

An "Operation Execution" is the process through which Command Template is processed, resulting in commands inputted into the Target System.

1.3.5. Resource

In the context of the ECP, "Resource" is synonym of connection instance.

1.3.6. Pool

In the context of the ECP, a "Pool" is a set of established and authenticated connections (resources) to a single Target System that are kept ready to use. Each connection instance belongs to a single "Pool". Connection instances life time is managed by the "Pool". Pools are identified by name.

1.3.7. SubPool

A "SubPool" is a subset of the connections belonging to a Pool which are established with the Target System through the same interface, what generally implies though the same IP and Port (and user). The existence of the "SubPool" is only needed in the context of the ECP Configuration and Administration. In other contexts its use is transparent to the user. Each SubPool belongs to a single Pool. Every connection belongs to a single SubPool.

1.3.8. Equipment Driver

An "Equipment Driver" is a class whose instance encapsulates a single TCP/IP connection as a Pool Resource and is in charge of establishing, authenticating, verifying, and closing the underlying connection, when required by the Pool and as needed by the Target System. As some of this processes (especially authenticating, verifying and closing the connection) are dependent on the Target System type, usually a different "Equipment Driver" is needed for each Target System type, hence its name. It allows the developer and designer to easily add functionality to the ECP on per connection, per equipment, per equipment connection or even on connection event basis. Equipment Drivers must be provided by the ECP User.

The "Equipment Driver" is also in charge of executing every individual Commands Template command, that is: composing the Target System command, sending it to the Target System, reading the Target system answer, and interpreting it. Nevertheless, this functionality is provided by the ECP through inheritance.

For some tasks (such as establishing and closing the connection, or sending and reading data from it), the Equipment Driver will usually rely on a Protocol Driver to perform them as very often those task are not dependant on the Target System type, but on the network protocol to communicate with it. Entrusting this task on the Protocol Driver allows the programmer to reuse network protocol dependant functionality.

Typically, a different Equipment Driver is needed for each model of switch or router.

In the context of the ECP, the terms "connection", "Resource", and "Equipment driver", are interchangeable.

1.3.9. Protocol Driver

A "Protocol Driver" is a class whose instance encapsulates a single TCP/IP connection, and is in charge of performing the most basic operations at low level, that is: establishing and closing the connection, sending and reading data from it, and encoding and decoding those data as needed by the Target System interface. Generally speaking, a Protocol Driver provides partial or total independence from the Application Layer of the OSI model. Entrusting this task on the Protocol Driver allows the programmer to reuse network protocol dependant functionality and the same Equipment Driver with different communication protocols.

The ECP provides Protocol Drivers for Telnet, SSH, and raw TCP network protocols.

1.4. General Architecture

On the highest level the ECP Module can be divided in two entities: the ECP Client and the ECP Service.

1.4.1. ECP Client

The ECP Client always is the entry point for the ECP user to the ECP Module, regardless of connection method or configuration (see Figure 1: ECP Simplified General diagram).

The ECP Client is basically an ECP Service, without a Pool Manager. As such, it is able to execute Operations by itself and without the need of an ECP Service, opening and closing a new connection to the Target System for every Operation execution (Direct Connection), or delegating the execution of the Operation on the ECP Service (Pooled Connection). However, when using Direct Connections it can't profit on the aforementioned advantages of the RMI Service (load balancing, high availability and resources use optimization).

The ECP Client is constituted by two entities: The ECP Template Parser (`com.hp.spain.connection.TemplateParser`) and the ECP Operation Engine (`com.hp.spain.connection.CLICommands`).

The ECP Template Parser receives a Command Template (and some configuration) as input, returning an accordingly constructed ECP Operation Engine as a result.

The ECP Operation Engine receives connection configuration (and additional Operation commands if needed) as input, and when executed returns the session stdin and stdout or an exception if the Operation failed.

Depending on how the Template Parser and Operation Engine were configured, the real Operation execution will take place either locally (that is, in the client's Java Virtual Machine instance) or remotely (that is, in a different Java Virtual Machine instance)

The figure Figure 2: Direct Connection Operation Execution Diagram represents a Direct Connection Operation execution. See ECP Service for an explanation of Pooled Connections.

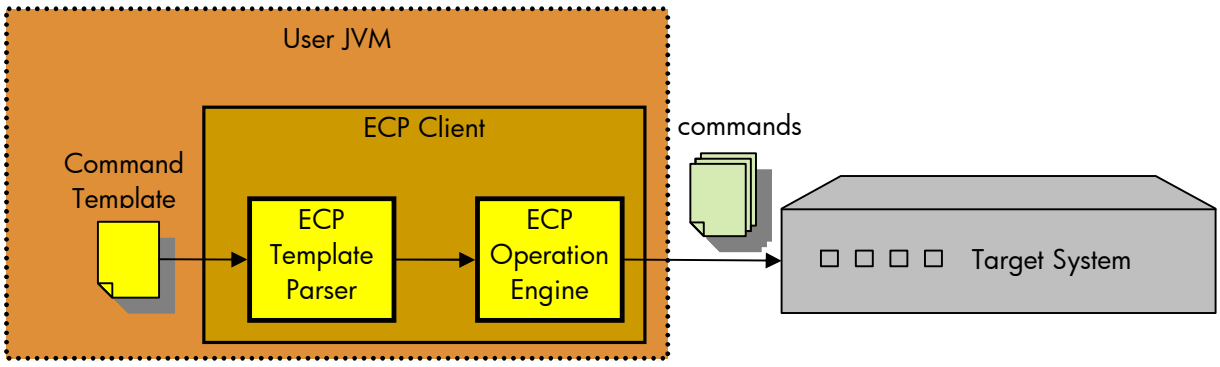


Figure 2: Direct Connection Operation Execution Diagram.

1.4.2. ECP Service

The ECP Service is basically an ECP Client which retrieves the connections to the Target System from a Pool Manager, instead of creating them (see ECP Client).

If the ECP Client Operation Engine is configured to use Pooled Connections, on execution, instead of creating a connection, it will serialize the Parsed Command Template (contained by itself), and send it via RMI to the ECP Service.

On reaching the ECP RMI Service, The serialized Parsed Command Template will be used to instantiate an equivalent of the client's ECP Operation Engine. A connection from the Pool Manager will be assigned to this Operation Engine, which it will use to execute the Operation. The Operation will be executed as if from the client, but with a connection obtained from the Pool Manager instead (see Functionality and Architecture

Connection and Pool Manage for additional detail). A different Operation Engine will be instantiated for each Operation, and multiple Operations may be executed concurrently.

The stdin and stdout or the failure of the Operation will be sent back to the caller Operation Engine (that is, the client's one).

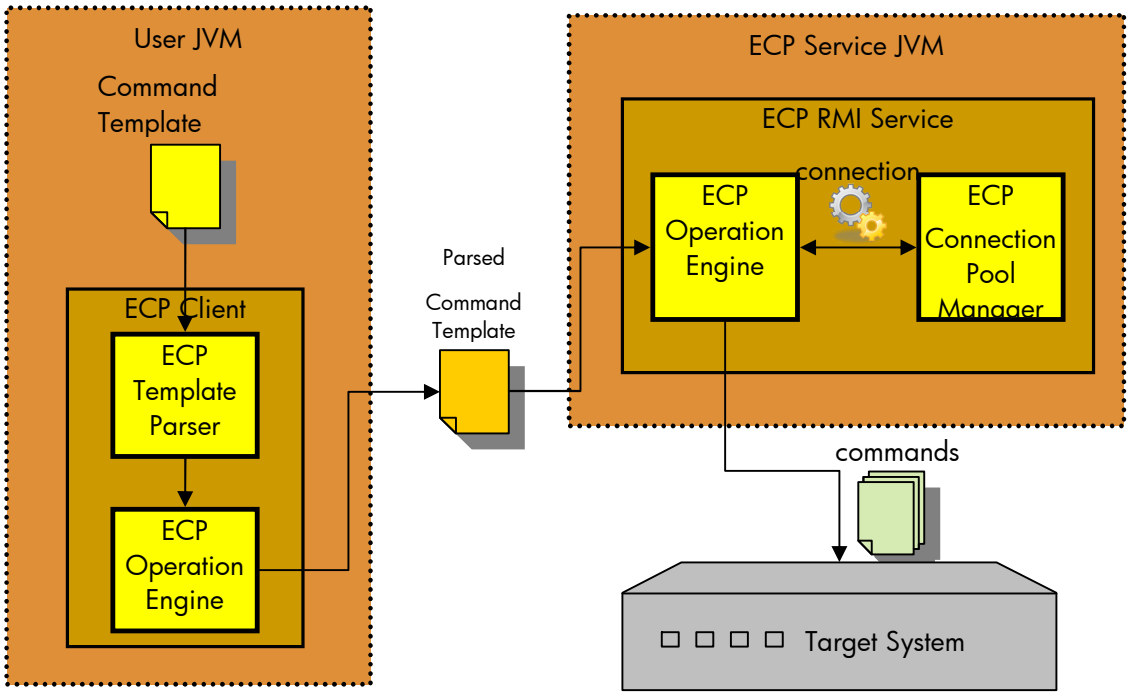


Figure 3: Pooled Connection Operation Execution.

2. Functionality and Architecture

2.1. Connection and Pool Management

A single instance of the Pool Manager exists in the ECP Service. The Pool Manager contains a single Pool for each Target System (in a typical configuration).

Each Pool contains all the connections to a Target System, and is responsible of their life time and management. Additionally, it is responsible for:

a) Connections reuse. The connections are kept alive, opened and authenticated, reusing the connections while possible.

b) Identifying redundant interfaces on the Target System, and their connections, providing high availability.

c) Queuing and prioritizing the Operation Engines' requests for connection to the Target System, providing load balance.

d) Target System independence.

e) Protocol independence.

See Figure 4: Pool Manger Architecture

2.1.1. Connection Reuse

Opening and maintaining a connection for each user is costly and wastes resources. On the contrary, pooling the connections enhances the performance of executing commands on a Target System. After a connection is created, it is placed in the Pool and reused over again while possible so that another connection does not have to be established and authenticated. The Pool creates (`initialize`) and destroys (`finalize`) new connections as needed, not exceeding the configured limits and politics. Connections are verified for consistency before being assigned to a client (`verify`). Additionally pooling the connections allows abstracting the client of the details of the connections management. Pooling the connections achieves reliable connections reuse. See Figure 4: Pool Manger Architecture

2.1.2. High Availability

Every Pool may have one or more SubPools. Each SubPool represents a connection factory and container. Every SubPool comply the following rules:

a) Each SubPool "owns" a different Target System interface. This means that all ECP connections to that Target System through that interface should be created and contained by the same SubPool instance.

b) Connections from different SubPools should be equivalent, that is, executing an Operation through one or another SubPool should have the same effects on the Target System (provided the same initial Target System State).

Complying with this rules, allows the ECP to temporarily ignore a SubPool (interface) if it fails and becomes unusable (and another SubPool exists in the Pool), using the other SubPools (interfaces) instead. SubPooling the connections achieves high availability. See Figure 4: Pool Manger Architecture.

2.1.3. Target System Independence

The ECP needs to be able to connect, login, verify and disconnect the connections to the Target Systems as part of the Pooled connections management. As these processes are Target System specific, the ECP is unable to do so by itself. As a consequence, the ECP User must provide an Equipment Driver which performs those operations on behalf of the ECP. The Equipment Driver will wrap a connection, abstracting the ECP from the real tasks needed for those operations. Roughly speaking, the Equipment Driver scope is at a "per command" level. See Equipment Driver and Figure 4: Pool Manger Architecture.

2.1.4. Protocol Independence

Although Equipment Drivers perform Target System specific tasks, the underlying network protocol is usually standardized, and is not Target System dependant. For example, is very common for Target Systems to use SSH or Telnet protocols. To ease Equipment Driver development and allow protocol interchangeability, a Protocol Layer abstraction layer is implemented, called "Protocol Driver". That layer will be responsible for establishing and closing the connection, sending and reading data from it, and encoding and decoding those data as needed by the Target System interface.

The ECP provides Protocol Drivers for Telnet, SSH, and raw TCP network protocols. See Protocol Driverand Figure 4: Pool Manger Architecture.

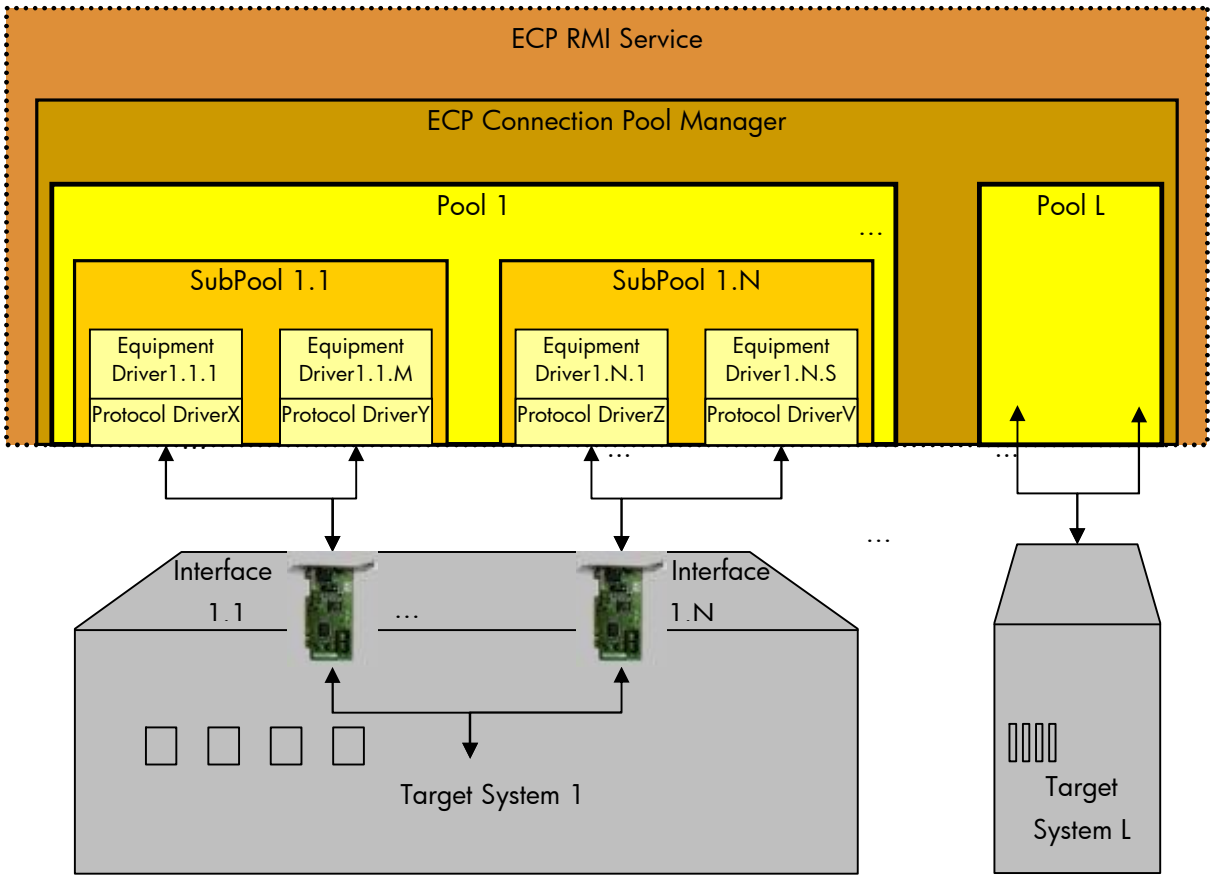


Figure 4: Pool Manger Architecture.

2.1.5. Load Balance

Every Pool, has a configurable number of "Request Queues", where clients in need of a connection are kept waiting for their turn to acquire a connection. Queues can be prioritized, allowing critical Operations to remain as short as possible waiting for an available connection, and avoiding clients from becoming starved because of a high not critical Operations load. The priority of each request is established programmatically.

The frequency at which requests are dispatched and the number of available connections on each SubPool can be configured, allowing management of the load over the Target System and the ECP host. Request queuing and Pool size achieve load balance.

2.2. Pool and Connection types

Two types of Connection Pools are available, depending on how the pools are created.

2.2.1. Static vs Temporary Pools

ECP Module provides two different types of Pools: Static and Temporary.

Functionally, Temporary Pools are exactly the same as Static Pools, the only difference being that Temporary Pools will expire if unused for a configured amount of time, while static Pools will never expire.

Temporary Pools are useful when a Target System is going to be used for a short period of time and remain unused for long periods. Temporary Pools allow saving host resources in such situation.

When Pools are used, the Operation Execution is delegated on the ECP Service. See ECP Service.

2.2.2. Direct Connections (Not Pooled Connections)

When using Direct Connections, a connection is created for each executed Operation, being the connection private to the ECP Operation Engine instance used to issue the Operation. The Connection exists in the context of the ECP Operation Engine instance JVM. The Operation is executed in the JVM of the client. No ECP RMI Service is needed for this kind of Operation, although the Equipment Driver and Protocol Driver and their libraries will be needed. See ECP Client.

2.2.3. Dynamic Pools

The ECP Module allows the user to programmatically create Pools. Programmatically created Pools are referred "Dynamic Pools". Dynamic Pools are usually temporary, although they can be static. As a consequence, "Dynamic Pools" aren't created independently, but as part of the Operation Executions which uses them. This is due to the fact that a client can't know whether the Dynamic Temporary Pool will still exist when the Operation Execution call is processed by the RMI ECP Service. For these reason, Operation Executions which use Dynamic Pools always carry the Dynamic Pool definition. On arrival to the ECP Service, the Dynamic Pool will be created if it does not exist. If it exists, the running Dynamic Pool instance will be used.

2.3. Commands Template

As "Commands Template" we understand a specially crafted String where, using a syntax specified by the ECP, the commands to Do, Undo, Commit and Rollback the Operation are established.

A Velocity Engine version 1.4 is provided with ECP, to ease the implementation of dynamic Commands Templates for the user. Through the method `TemplateParser#composeTemplate()`, a Velocity Commands Template can be easily merged with the data. See http://velocity.apache.org/ for more details. See Commands Template Reference.

What follows is an example of a possible Commands Template:

```
[TEMPLATE:Do]


[TEMPLATE:Section 0]

show eth0 connections
  [TEMPLATE:EndStrPattern "admin#"]
  [TEMPLATE:Pattern "detination IP: (.*)"]
  [TEMPLATE:Array "destinationIPs"]

show eth1 connections
  [TEMPLATE:EndStrPattern "admin#"]
  [TEMPLATE:Pattern "detination IP: (.*)"]
  [TEMPLATE:Array "destinationIPs"]


[TEMPLATE:ForEach "var" In " destinationIPs"]
      ping  %var% -n 1
            [TEMPLATE:EndStrPattern "admin#"]
[TEMPLATE:EndFor]

[TEMPLATE:Undo]
[TEMPLATE:Section 0]
```

The previous template executes queries connections through `eth0`, storing the destination IP in the array variable `destinationIPs`. The same process is repeated on eth1. After that, a ping is executed to all the obtained IPs. All commands are over when the prompt `admin#` is encountered. As the Template does not modify the Target System state, no Undo commands are needed.

2.4. Operation Execution

Operation Execution is the process through which the commands needed for the Operation to be done or undone are issued, appropriately handling the errors and rolling back the partial configuration change or committing the configuration changes.

The client will provide a "Commands Template", a specially crafted String where, using a syntax specified by the ECP, the commands to Do, Undo, Commit and Rollback the Operation are established. The Commands Template may contain conditional or looped execution of commands. Commands output may be stored in variables and later used in conditions and commands. For a more detailed explanation see 2.3 Commands Template.

Each command in an Operation belongs to one of the following groups:

a) Do: The commands collection to perform the configuration change.

b) Undo: The commands collection to cancel the configuration change.

c) Error: A set of commands to execute whenever a command output is identified as an unsuccessful command execution message.

d) Commit: The commands to:

   a. Make the configuration modifications effective/visible.

   b. Save the configuration to a persistent media.

e) Rollback: The commands to:

   a. Restore the previous configuration from a persistent media.

   b. Make the previous configuration effective/visible.

This is the recommended use for these groups, although other uses may be possible, always taking in to account the Do/Undo/Commit/Rollback logic. That logic is dependant on the call used to execute the Operation. Four methods are available: "Execute", "ExecuteActivation", "Revert" and "InverseActivation". See the following diagrams for more detail:

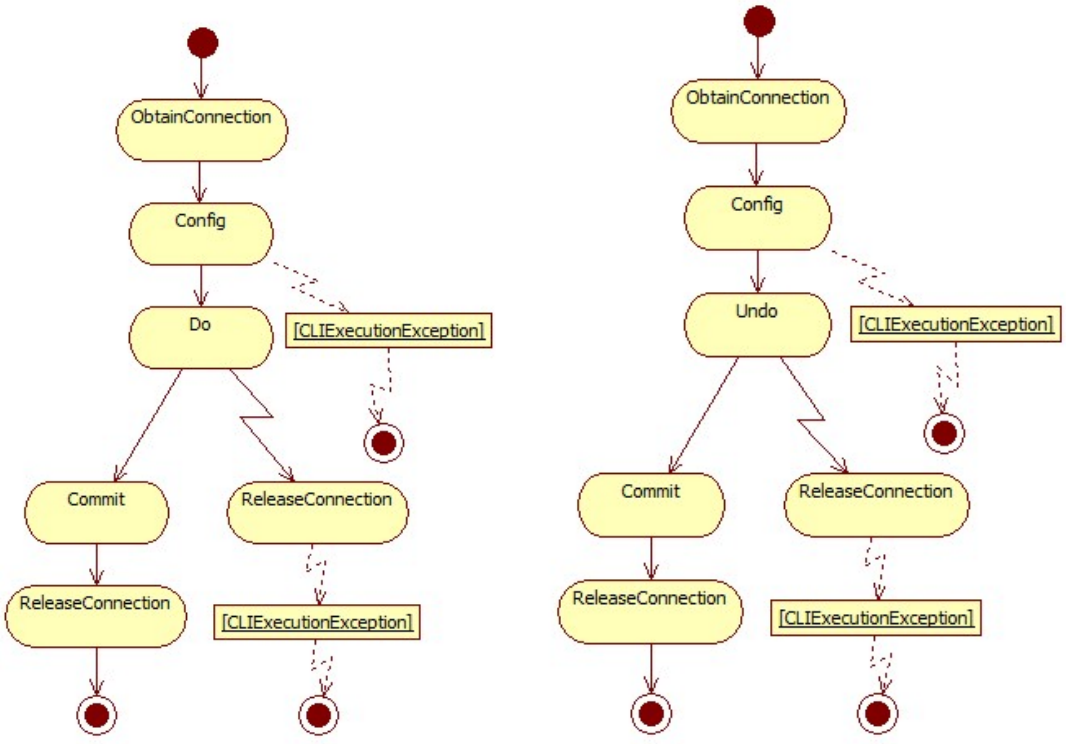


Figure 5: "Execute" and "Revert" activity diagrams.

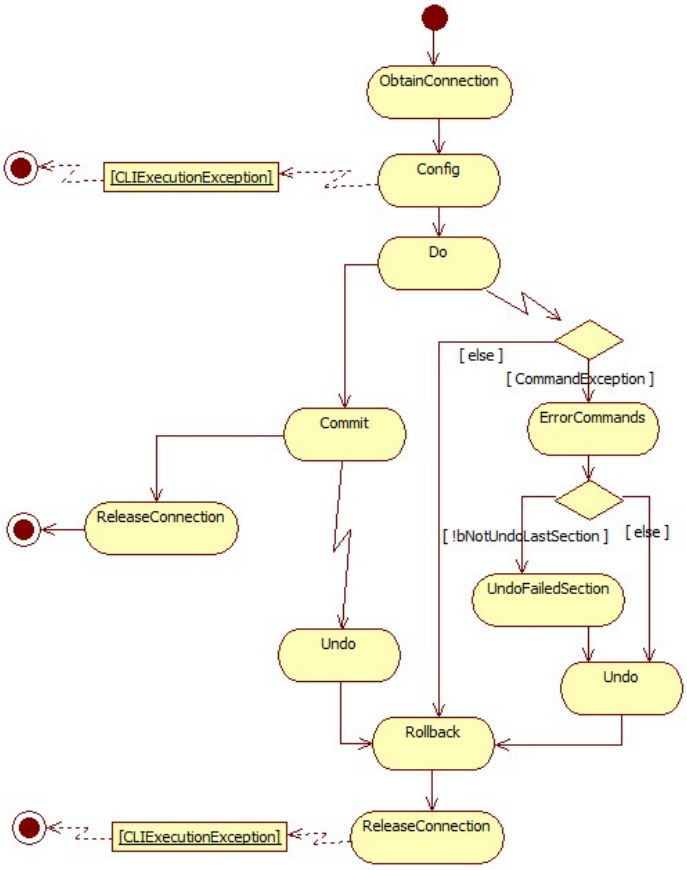


Figure 6: "ExecuteActivation" activity diagram.

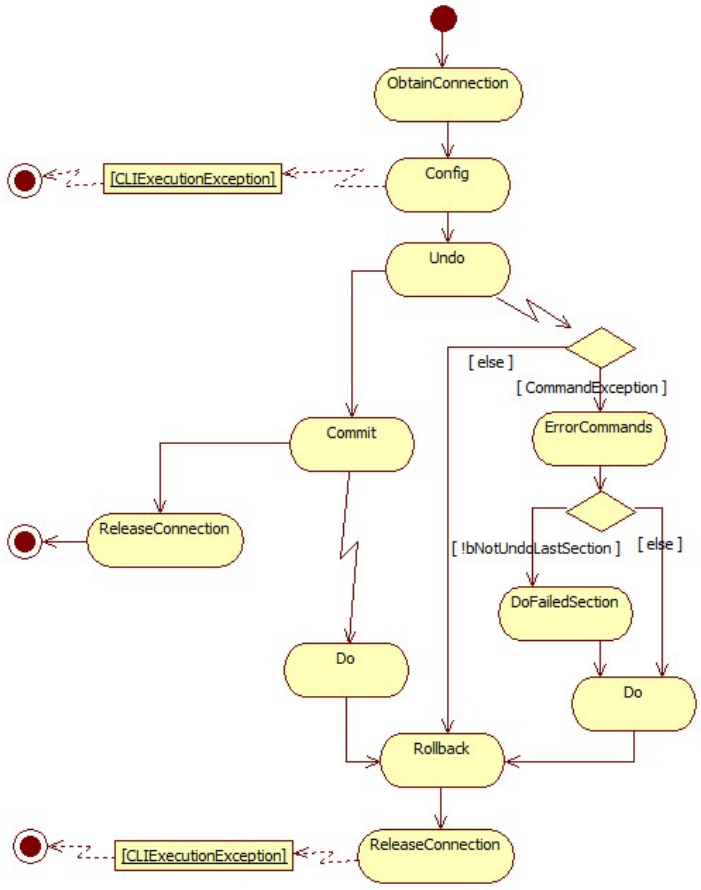


Figure 7: "InverseActivation" activity diagram.

2.5. Real-time Monitoring

From SPI version 2.3 onwards the ECP is able to provide real time information of its execution through JMS. Currently, ECP includes Active MQ 4.1.1 which fully implements JMS 1.1. If JMS monitoring is enabled, ECP may start its own embedded JMS service (by default) or connect to a remote one. Active MQ includes many features, like persistent, transactional and XA messaging; message groups, virtual destinations, wildcards and composite destinations; pluggable transport protocols as TCP, SSL, UDP, in-VM (embedded); clustering; bridging to other JMS providers; JMX administration, etc…

3. First Steps

3.1. Equipment Driver Development

3.1.1. Equipment Driver Development Introduction

As previously said (see Equipment Driver) an "Equipment Driver" is a class which encapsulates a single connection as an ECP Resource (a pooled connection). As such, an Equipment Driver must implement the functionality expected by the ECP, that is:

a) The capability of executing commands.

b) The ability of behaving as an ECP Connection.

The main part of that functionality is already implemented and inherited from the driver parent classes `EquipmentDriver` and `ConnectionResource`, simplifying the driver development.

The capability of executing commands is fully provided by the `EquipmentDriver` class, very rarely requiring additional implementation or overriding in the driver.

The ability of behaving as an ECP Connection is partially provided by the `ConnectionResource` class, and as a consequence, additional implementation and overriding will be needed in the driver.

In addition, an instance of another class, the `ProtocolDriver`, will provide protocol independence, allowing the use of the same Equipment Driver with varying communications protocols (telnet, SSH, etc…) to the destination equipment.

While developing the driver, the programmer must be careful not to choose libraries versions which differ of the versions present in `$ECP_LIB` (if Pooled Connections are used) and/or the versions present in the `$ACTIVATOR_THIRD_PARTY/lib` (if Direct Connections are used). The Equipment Driver classes and its dependencies may have to be deployed in one or both of those paths and the driver classes will be loaded using the same ClassLoader as the rest of libraries there. See Equipment Driver Deployment for further details.

See Available Equipment Drivers for a list of some Equipment Drivers already implemented. Notice that that list includes only the precise versions of the Target Systems against which a certain driver has been or is being used in a production environment. These drivers might be compatible as is with some other Target Systems or versions, or might be easily adapted to them.

3.1.1.1. Equipment Driver Classes

Every Equipment Driver must inherit from com.hp.spain.connection.`ConnectionResource`. The following diagram shows the typical class diagram of an Equipment Driver example (`HPUXConnectionResource`).

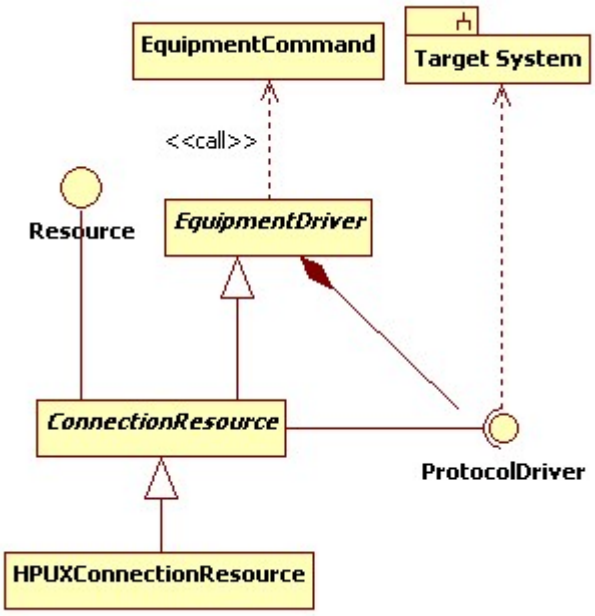


Figure 8: Equipment Driver example (`HPUXConnectionResource`) typical class diagram.

i. com.hp.spain.connection.ProtocolDriver Class

A "Protocol Driver" is a class whose instance encapsulates a single TCP/IP connection, and is in charge of performing the most basic operations at low level, that is: establishing and closing the connection, sending and reading data from it, and encoding and decoding those data as needed by the Target System interface. Generally speaking, a Protocol Driver provides partial or total independence from the Application Layer of the OSI model. Entrusting this task on the Protocol Driver allows the programmer to reuse network protocol dependant functionality and the same Equipment Driver with different communication protocols.

The ECP provides Protocol Drivers for Telnet, SSH, and raw TCP network protocols.

See com.hp.spain.connection.ProtocolDriver Class for further information.

ii. com.hp.spain.connection.EquipmentCommand Class

This class encapsulates the information needed to execute a command on the Target System, that is, to construct the string to be sent, send it and read its output, interpret it, and extract information from it. See **Error! Reference source not found.**com.hp.spain.connection.EquipmentCommand Class for further details.

iii. com.hp.spain.connection.EquipmentDriver Class

This class contains the functionality needed to execute a command on the Target System represented as an `EquipmentCommand`, that is, construct the string to be sent, send it, and process its output. It also contains some basic connection operations, such as establishing a connection, closing a connection, and authenticating. See **Error! Reference source not found.**com.hp.spain.connection.EquipmentDriver Class for further information.

iv. com.hp.spain.connection.Resource Class

This interface represents a basic pooled object. Defines the operations needed to manage an object belonging to a pool. See **Error! Reference source not found.**com.hp.spain.connection.Resource Class for further information.

v. com.hp.spain.connection.ConnectionResource Class

This class implements an EquipmentDriver as a pooled object. It implements the functionality defined by `Resource` using the operations provided by `EquipmentDriver`, that is, executing commands and basic connection operations. See **Error! Reference source not found.**com.hp.spain.connection.ConnectionResource Class for further information.

3.1.1.2. Equipment Driver inside the ECP

The following diagram shows the relation of

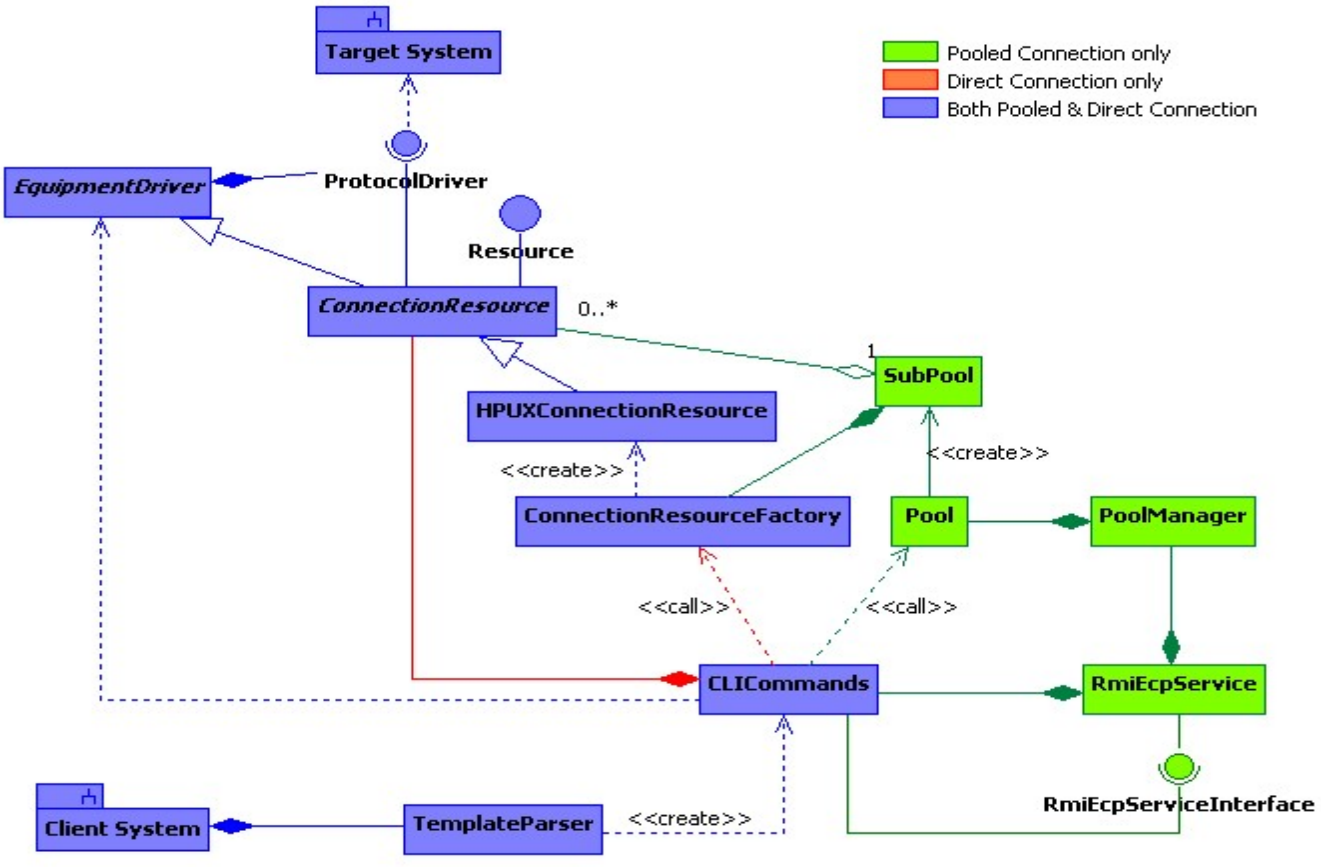


Figure 9: An example Equipment Driver (`HPUXConnectionResource`) and its relation with the ECP.

3.1.2. Equipment Driver Generic

This driver is a usefull class to avoid the implementation of the different driver's states. Then when the developer has to make a new driver just focus on the equipments requirements.

The driver has to extend the class com.hp.spain.connection.EquipmentDriverGeneric and overwrite next methods. Some of them are optional.

void verifyLoggedIn(): optional. Makes the verification when the driver status is loggedin

void verifyConnected(): optional. Makes the verification when the driver status is connected

void verifyConfigMode(): optional. Makes the verification when the driver status is configMode

void verifyUnknownMode(): optional. Makes the verification when the driver status is unknown

void enterConfigMode(): optional. Execute the commands required to config the connection

void exitConfigMode(): optional. Execute the commands required to unconfig the connection

void logout(): optional. Executes the commands to logout the connection

void initalizeSpecificParameters(String specificParameters): optional.

void waitForLoginUserPrompt(): usually required for protocol without authentication support. Synchronize the login prompt.

void waitForLoginPwdPrompt(): usually required for protocol without authentication support. Synchronize the login password.

void waitForInitialCommandPrompt(): usually required. Synchronize the initial prompt.

3.1.3. Equipment Driver Deployment

The Equipment Driver may have to be deployed in two different paths, depending on the type of connection used.

For Pooled Connections, the Equipment Driver jar and its dependencies must be placed inside the `$ECP_LIB` directory, and the ECP Service restarted. The ECP Service should be restarted whenever that directory contents are modified for the ECP to incorporate the changes. For the Equipment Driver to be instantiated a Static or Dynamic Pool which uses that Equipment Driver must be created and depending on the ECP configuration, even a Commands Template executed against it.

For Direct Connections, the Equipment Driver jar and its dependencies must be placed inside the `$ACTIVATOR_THIRD_PARTY/lib` directory. The Micro Workflow Manager and the Resource Manager must be restarted for the changes to take effect. The Micro Workflow Manager and the Resource Manager should be restarted whenever that directory contents are modified. A Commands Template must be executed for the Equipment Driver to be instantiated.

3.1.4. Available Equipment Drivers

The following Equipment Drivers have been already developed and are available:

Equipment Driver	Tested On				Use Case		
	Manufacturer	**Model**	**Sw/Fw Version**	**Type**	**Context**	**Operations**	**Protocol**
cisco-ovsa-plugin	Cisco	Catalyst 2960 Series Switch. Unknown Models	?	Ethernet Switch	Level 2 Network	VLAN Configuration, ACL's, DHCP	Telnet
		Catalyst 4503 Switch	?				
oxe-ovsa-plugin	Alcatel-Lucent	OmniPCX Enterprise	7.1	Communications Server	VoIP Telephone Exchange	Channel Administration	Telnet
			8.1				
juniper-ovsa-driver	Juniper Networks	M40e	?	Router	Provider Router IP/MPLS Network Access Router	Configuration Configuration diagnosis	SSH
teldat-ovsa-driver	Teldat	Atlas 250	?	Router	Client Router	Configuration diagnosis	Telnet
cisco-ovsa-driver	Cisco	2801 Integrated Services Router	?	Router	Client Router	Configuration diagnosis	Telnet
		2621XM Multiservice Router	?				
catalyst-ovsa-driver	Cisco	Catalyst 3560-24TS	?	Ethernet Switch	Client Router	Configuration diagnosis	Telnet
		Catalyst 3560-48TS	?				
		Catalyst 3550-24-EMI	?				
		Catalyst 3550-12G	?				
riverstone-ovsa-driver	Riverstone	RS1100	?	Router	Client Router	Configuration diagnosis	Telnet
		RS 3100	?				

Notice that this list includes only the precise versions of the Target Systems against which a certain driver has been or is being used in a production environment. These drivers might be compatible as is with some other Target Systems or versions, or might be easily adapted to them.

3.1.5. Generic Template Equipment Driver

This driver is able to connect to any type of equipments using some variables or templates. The most important fearture of this driver is the capability to connect any equipment and not require any java development.

This equipment driver is configured using the class com.hp.spain.connection.TemplateDriver. We can configure this driver adding into the DriverSpecificParameters the extra variables on properties format or referring to the Common Configuration.

The next 5 templates that can be configured into the database or into a file, finding first in database.

LOGIN_TEMPLATE: template to make the login (note: this template has sense in protocol driver that doesn'tmakes the authentication)

LOGOUT_TEMPLATE: the logout template, typically the exit command

ENTER_CONFIG_MODE_TEMPLATE: the template to configure all the sessions attributes required.

EXIT_CONFIG_MODE_TEMPLATE -> the template to unconfigure

VERIFY_TEMPLATE: template to verify if the connection is ok.

These templates will receive the parameters configured into the DriverSpecificParameters and the next parameters configured into the subpool:

USER: user name

PASSWORD: user password

PASSWORD_ENABLE: password enable

HOST: ip host value

Also, next variables can be define to make easier the templates:

LOGIN_USER_PROMPT: synchronize the driver with the login prompt.

LOGIN_PWD_PROMPT: synchronize the driver with the password prompt.

INITIAL_PROMPT: synchronize the driver with the inital prompt.

Also, this driver has the capability to add error patterns, failure patterns, non error patterns and error message to all the commands that are executed into a command template. In case, it's required to add these patterns to the connections templates (LOGIN_TEMPLATE, ENTER_CONFIG_MODE_TEMPLATE, …) the variable ADD_PATTERNS_CONNECTION_TEMPLATES has to be setted to true.

The only requirement to set these patterns is define variables with next prefix:

ENDSTRING_PATTERN

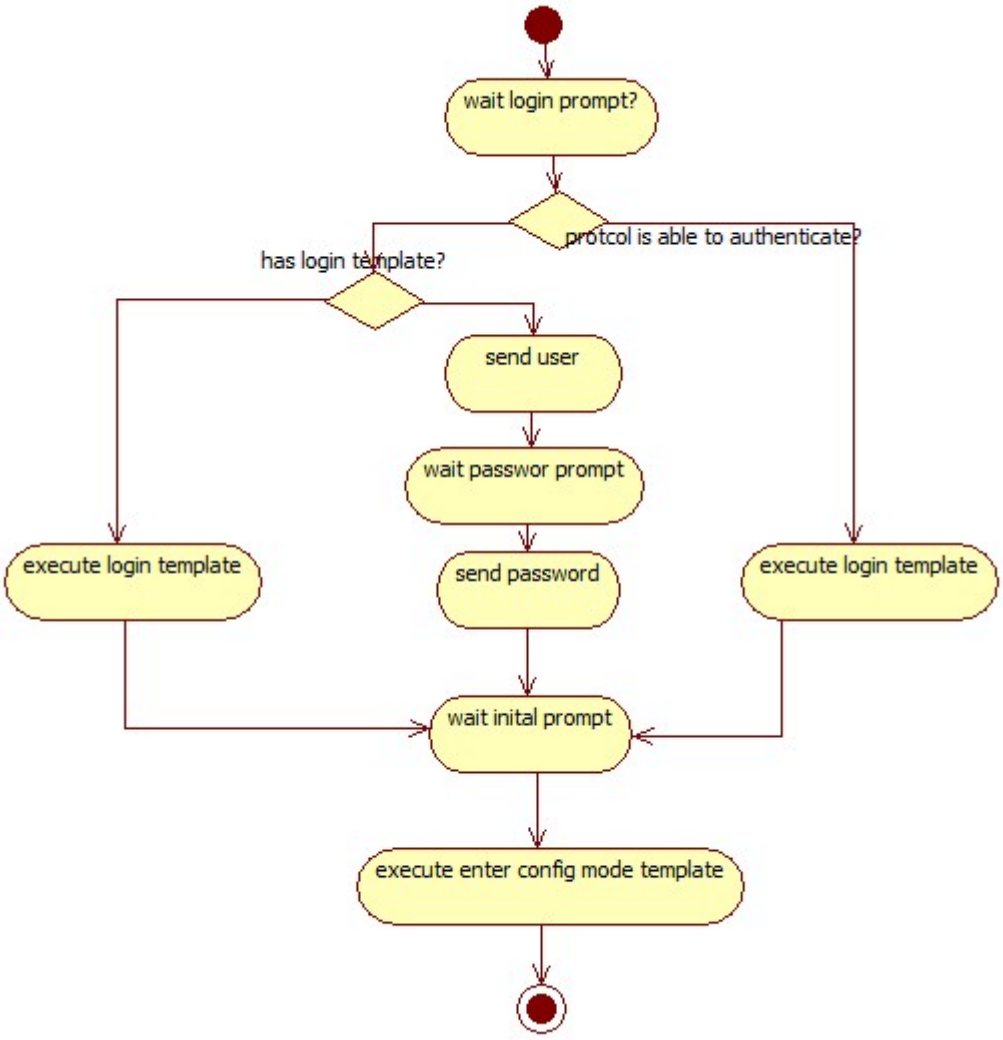
ERROR_PATTERN

FAILURE_PATTERN

NONERROR_PATTERN

ERROR_MESSAGE: in this case only can be defined one and the variable is required to have this name.

3.1.5.1. Connection



When the driver starts the connection the first step is to check if the LOGIN_USER_PROMPT is configured. In that case, synchronize this prompt. After that, the LOGIN_TEMPLATE is executed if it's configured. If not and the protocol driver doesn't support authentication, send the user, synchronize the password prompt (LOGIN_PWD_PROMPT) and send the password.

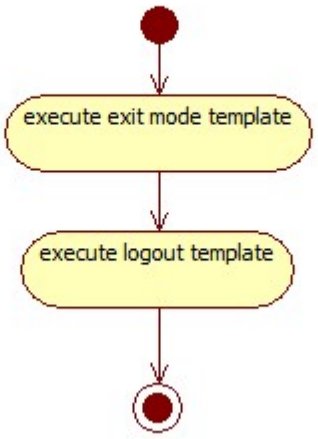
In this moment, the driver is authenticated and in case the INITIAL_PROMPT is configured the driver synchronizes the initial prompt.

Usually, when the protocol supports the authentication (for example, ssh) it's only necessary to configure the INITIAL_PROMPT and not the LOGIN_TEMPLATE and neither LOGIN_USER_PROMPT.

After synchronize the INITIAL_PROMPT the driver execute the ENTER_CONFIG_MODE_TEMPLATE and finally executes the VERIFY_TEMPLATE.

In this moment, the driver is connected and ready to be used.

3.1.5.2. Disconnect



First, the driver execute the template EXIT_CONFIG_MODE_TEMPLATE and after that the LOGOUT_TEMPLATE.

3.1.5.3. Examples of DriverSpecificParamters

Telnet easiest configuration:

LOGOUT_TEMPLATE=logout.vm

LOGIN_USER_PROMPT=.*login\:

LOGIN_PWD_PROMPT=.*password\:

INITIAL_PROMPT=C\:.*\>

Ssh easiest configuration:

INITIAL_PROMPT=#

Telnet using login template and patterns:

LOGOUT_TEMPLATE=logout.vm

LOGIN_USER_PROMPT=.*login\:

```
LOGIN_TEMPLATE=login.vm
VERIFY_TEMPLATE=/opt/HP/OV/ECP/templates/verify.vm
ENDSTRING_PATTERN= C\:.*\>
ERROR_PATTERN_1=ERROR [0-9]+ .*
ERROR_PATTERN_2=[0-9][0-9] ERROR .*
FAILURE_PATTERN_1=FAILURE [0-9]+ .*
FAILURE_PATTERN2=[0-9][0-9] FAILURE .*
ERROR_MESSAGE=error message
NONERROR_PATTERN_1=Warning .*
```

Ssh using enter mode config template and patterns:

```
LOGOUT_TEMPLATE=logout_ssh.vm
LOGIN_TEMPLATE=login.vm
ENTER_CONFIG_MODE_TEMPLATE=enterConfigMode.vm
EXIT_CONFIG_MODE_TEMPLATE=exitConfigMode.vm
VERIFY_TEMPLATE=/opt/HP/OV/ECP/templates/verify_ssh.vm
INITIAL_PROMPT=\\[forge\\]\\$
ENDSTRING_PATTERN=\\[forge\]\\$
ERROR_PATTERN_1=ERROR [0-9]+ .*
ERROR_PATTERN_2=[0-9][0-9] ERROR .*
FAILURE_PATTERN_1=FAILURE [0-9]+ .*
FAILURE_PATTERN2=[0-9][0-9] FAILURE .*
ERROR_MESSAGE=error message
NONERROR_PATTERN_1=Warning .*
```

3.2. ECP Service Process

3.2.1. Starting ECP Service

To start the ECP Service, use the following:

Windows:

```
$ECP_BIN\StartServer.bat
```

On Unix:

```
$ECP_BIN\StartServer.sh
```

3.2.2. Stopping ECP Service

To stop the ECP Service, use the following:

Windows:

```
$ECP_BIN\StopServer.bat
```

On Unix

```
$ECP_BIN\StopServer.sh
```

3.2.3. Restarting ECP Service

Just stop and start the ECP Service.

3.2.4. Checking ECP Service

To check the ECP Service, use the following:

Windows:

```
$ECP_BIN\showStatus.bat
```

On Unix:

```
$ECP_BIN\showStatus.sh
```

3.3. Use Examples

What follows is a series of examples of ECP Clients. In those examples, the following class, simulating a client configuration, is used. You will probably have some other particular way of obtaining the configuration. Notice that, depending on the connection type, not all of the configuration parameters are needed:

```
package com.hp.spain.connection.pool.examples;

public class ExamplesConfiguration {

  //Commands Template
  private static String Template=
       "[TEMPLATE:Do]\n" +
       "[TEMPLATE:Section 0]\n" +
       "help\n" +
       "     [TEMPLATE:EndStrPattern \"nina.*\"]\n" +
       "     [TEMPLATE:Error \"%CLI-E-NOFACINST, no facility instance
allowed\"]\n" +
       "[TEMPLATE:Undo]\n" +
       "[TEMPLATE:Section 0]\n";
```

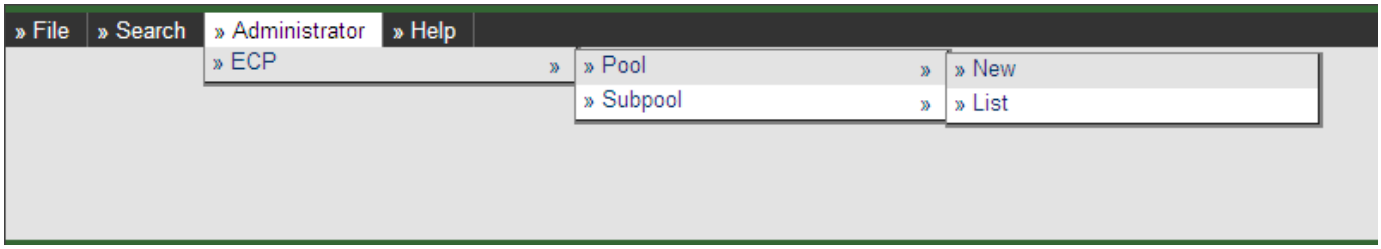
```
  //Target system data
  private static String Hostname="172.16.2.111";
  private static int Port=23;
  private static String Login="admin";
  private static String Password="pass4hpsa";
  private static String PasswordEnable="pass4hpsa";

  //Drivers data
  private static String Protocol="telnet";
  private static String
ConnectionResourceClassName="com.hp.spain.connection.RiverstoneRSConnectionR
esource";
  private static String AdditionalData="Other needed values";

  //Pool data
  private static String PoolName="examplePool";
  private static int MaxCon=3;
  private static int MinCon=1;
  private static boolean InitOnCreate=true;
  private static int OverMinimunConnTimeout=30000;
  private static int ReservedConnTimeout=60000;
  private static int PoolTimeout=600000;

  //ECP Instance data
  private static String ECPHost="127.0.0.1";
  private static String ECPPort="1200";
  private static int QueueID=1;

  public static String getAdditionalData() {
      return AdditionalData;
  }
  public static String getConnectionResourceClassName() {
      return ConnectionResourceClassName;
  }
  public static String getECPHost() {
      return ECPHost;
  }
  public static String getECPPort() {
      return ECPPort;
  }
  public static String getHostname() {
      return Hostname;
  }
  public static boolean isInitOnCreate() {
      return InitOnCreate;
  }
  public static String getLogin() {
      return Login;
  }
  public static int getMaxCon() {
      return MaxCon;
  }
  public static int getMinCon() {
      return MinCon;
  }
  public static int getOverMinimunConnTimeout() {
```

```
        return OverMinimunConnTimeout;
    }
    public static String getPassword() {
        return Password;
    }
    public static String getPasswordEnable() {
        return PasswordEnable;
    }
    public static String getPoolName() {
        return PoolName;
    }
    public static int getPoolTimeout() {
        return PoolTimeout;
    }
    public static int getPort() {
        return Port;
    }
    public static String getProtocol() {
        return Protocol;
    }
    public static int getReservedConnTimeout() {
        return ReservedConnTimeout;
    }
    public static String getTemplate() {
        return Template;
    }
    public static int getQeueID() {
        return QueueID;
    }
}
```

3.3.1. Creating and Using an Static Pool

In the source examples a Pool called "examplePool" will be used. What follows is a quick guide to create a Pool. Refer to the document "OVSA SPI for Service Providers - ECP Administration GUI - User Reference" for details on how to administer Pools and SubPools using the ECP GUI.

First, create the Pool (menu "Administrator->Pool->New")



Fill in the formulary that will appear.

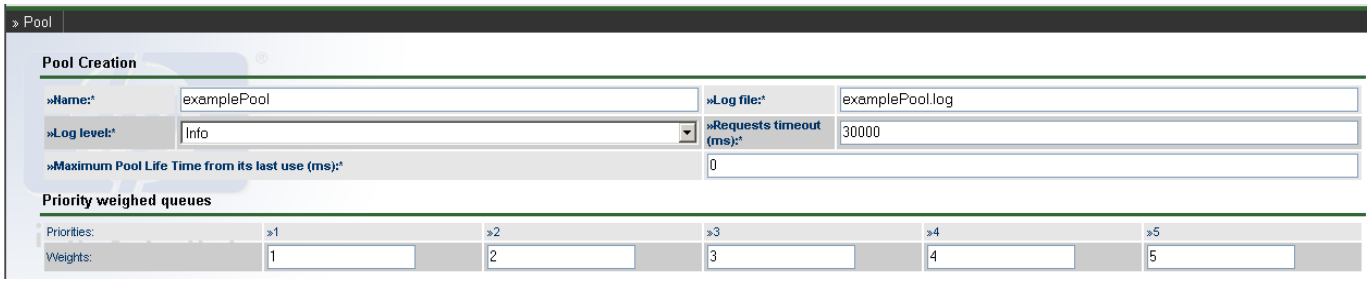
Name: "examplePool". The Pool ID. Will be used from code to reference to the pool.

Log File: "examplePool.log". Name of the file were the Pool activity will be logged.

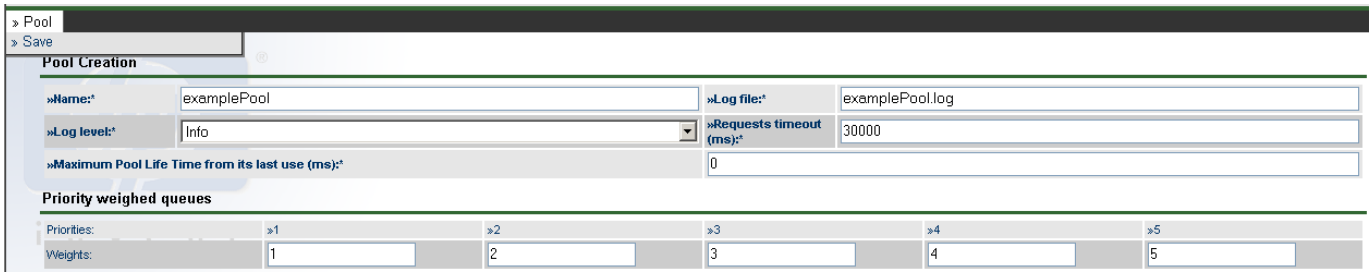
Log Level: info

Maximum Pool Life Time from…: 10000

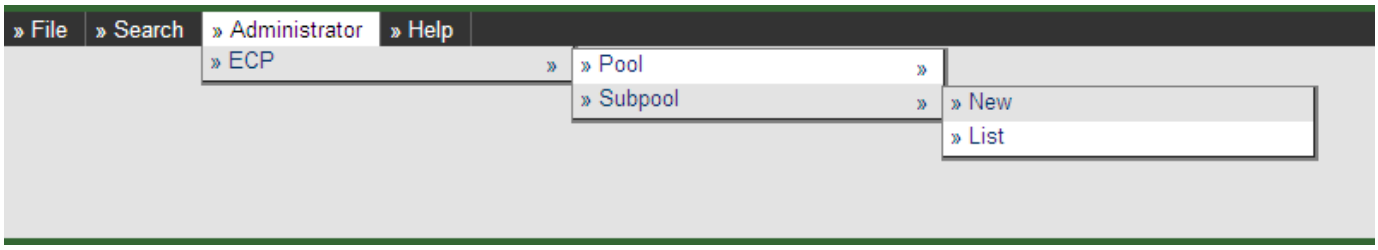
Weights: 1,2,3,4,5



Save the Pool (menu "Pool->Save")



After creating the Pool, create a SubPool (menu "Administrator->SubPool->New")



Fill in the formulary that will appear.

Pool Name: "examplePool". The Pool to which this SubPool belongs.

Min. Sessions: 10

Max Sessions: 100

Init Sessions: 1

Temporary Sessions life Time=1000000

Max. Sessions use time= 100000000

The rest of the values are dependent on the Target System. These values are given as an example

Equipment Connection Resource Class: Class of the Equipment driver. For example: "com.hp.spain.connection.RiverstoneRSConnectionResource"

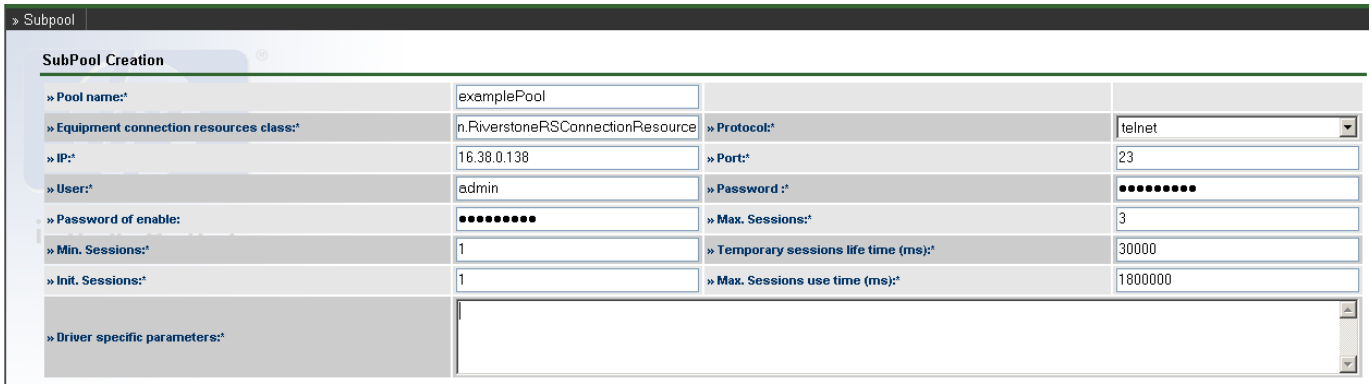
IP: Target System IP. For example: 172.16.2.111

Protocol: Protocol Driver to use. For example: telnet

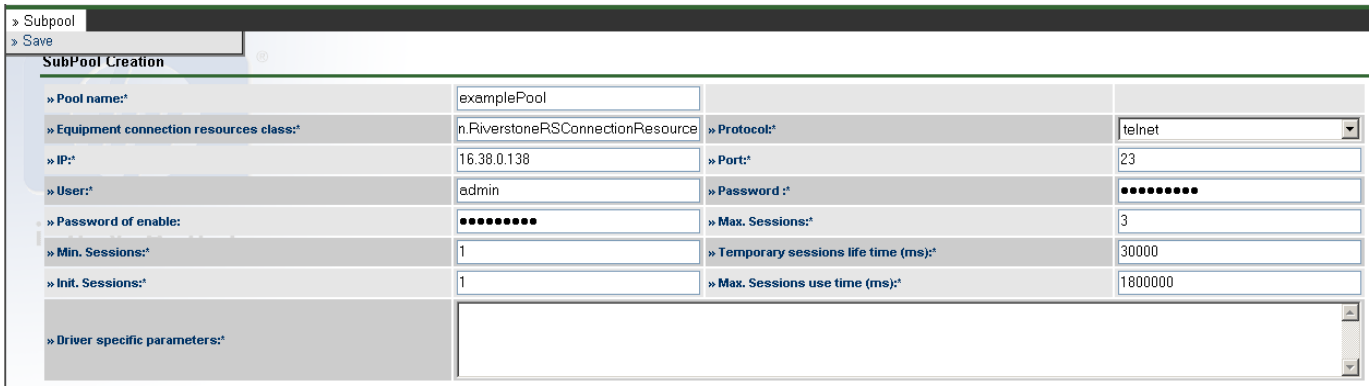
Port: Port to connect through to the Target System. For example: 23

User: User Name to log into the Target System. For example: admin

Password: Password to log into the Target System.



Save the SubPool (menu "SubPool->Save")



What follows is an example of static Pool use:

```
package com.hp.spain.connection.pool.examples;

import java.util.HashMap;

import com.hp.spain.connection.CLICommands;
import com.hp.spain.connection.CLIExecutionException;
import com.hp.spain.connection.TemplateParser;
import com.hp.spain.connection.TemplateParserException;

public class StaticPoolConnExample {

  public static void main (String[] args) throws CLIExecutionException,
TemplateParserException {
      HashMap oRet=null; //the Operation execution result
      TemplateParser parser; //the ECP Template Parser instance
      CLICommands cliCommands; //the ECP Operation Engine instance

      //ECP Template Parser instantiation and configuration
      parser=new TemplateParser();

      //ECP Operation Engine instantiation and configuration
      cliCommands =
parser.parseTemplate(ExamplesConfiguration.getTemplate());

      //ECP instance
      cliCommands.setRMIHostName(ExamplesConfiguration.getECPHost());
      cliCommands.setRMIPort(ExamplesConfiguration.getECPPort());

      //Operation execution
```

```
      oRet=cliCommands.execute(ExamplesConfiguration.getPoolName(),
ExamplesConfiguration.getQeueID());
      //Other possible executions would have been:

  //oRet=cliCommands.executeActivation(ExamplesConfiguration.getPoolName(),
ExamplesConfiguration.getQeueID());
      //oRet=cliCommands.revert(ExamplesConfiguration.getPoolName(),
ExamplesConfiguration.getQeueID());

  //oRet=cliCommands.inverseActivation(ExamplesConfiguration.getPoolName(),
ExamplesConfiguration.getQeueID());

      //Execution Output
      System.out.println("RESULT HASHMAP:");
      System.out.println(oRet);
      System.out.println("COMMANDS SENT:");
      System.out.println(cliCommands.getCommandsSent());
      System.out.println("STDOUT:");
      System.out.println(cliCommands.getStdOut());
  }
}
```

To execute the example, run the following command, where <classpath> should contain all the libraries contained in the directory $ECP_LIB plus the path where these classes have been compiled. The java version must be 1.4.2.

```
java -classpath <classpath>
com.hp.spain.connection.pool.examples.StaticPoolConnExample
```

3.3.2. Creating and Using a Dynamic Pool

It is possible to create a Pool programmatically, indicating its properties as part of an Operation Execution. Programmatically created pools are called "Dynamic Pools" and are usually temporary. See Dynamic Pools for a more detailed explanation.

```
package com.hp.spain.connection.pool.examples;

import java.util.HashMap;

import com.hp.spain.connection.CLICommands;
import com.hp.spain.connection.CLIExecutionException;
import com.hp.spain.connection.TemplateParser;
import com.hp.spain.connection.TemplateParserException;
import com.hp.spain.connection.pool.DynamicEcpProperties;

public class DynPoolConnExample {

  public static void main (String[] args) throws CLIExecutionException,
TemplateParserException {
      HashMap oRet=null; //the Operation execution result
      TemplateParser parser; //the ECP Template Parser instance
      CLICommands cliCommands; //the ECP Operation Engine instance
      DynamicEcpProperties oDynProps;

      //ECP Template Parser instantiation and configuration
```

```
      parser=new TemplateParser();
      //Target System Data
      parser.setHostname(ExamplesConfiguration.getHostname());
      parser.setPort(ExamplesConfiguration.getPort());
      parser.setLogin(ExamplesConfiguration.getLogin());
      parser.setPassword(ExamplesConfiguration.getPassword());
      parser.setPasswordEnable(ExamplesConfiguration.getPasswordEnable());

      //ECP Operation Engine instantiation and configuration
      cliCommands =
parser.parseTemplate(ExamplesConfiguration.getTemplate());
      //Equipment and Protocol Drivers
      cliCommands.setProtocol(ExamplesConfiguration.getProtocol());

  cliCommands.setConnectionResourceClassName(ExamplesConfiguration.getConnect
ionResourceClassName());
      //Pooling Data
      cliCommands.setDynamicPoolName(ExamplesConfiguration.getPoolName());
//optional. By default dynamic pool names are autogenerated.
      oDynProps= cliCommands.getDynamicEcpProperties();
      oDynProps.setPoolConfiguration(ExamplesConfiguration.getMaxCon(),
//maximum number of connections to be contained in the pool
            ExamplesConfiguration.getMinCon(), //minimum number of
connections to be contained in the pool
            ExamplesConfiguration.isInitOnCreate(), //initialize on
instantiation, instead of on firs use
            ExamplesConfiguration.getOverMinimunConnTimeout(), //Not used
timeout of connections over the minimum (ms)
            ExamplesConfiguration.getReservedConnTimeout(), //maximum time a
connection may be in use by an Operation (ms)
            ExamplesConfiguration.getPoolTimeout() //Not used timeout for
the pool
      );
      //ECP instance
      cliCommands.setRMIHostName(ExamplesConfiguration.getECPHost());
      cliCommands.setRMIPort(ExamplesConfiguration.getECPPort());

      //Equipment Driver additional initialization parameters

  oDynProps.setSpecificParameters(ExamplesConfiguration.getAdditionalData());

      //Operation execution
      oRet=cliCommands.execute(oDynProps,
ExamplesConfiguration.getQeueID());
      //Other possible executions would have been:
      //oRet=cliCommands.executeActivation(oDynProps,
ExamplesConfiguration.getQeueID());
      //oRet=cliCommands.revert(oDynProps,
ExamplesConfiguration.getQeueID());
      //oRet=cliCommands.inverseActivation(oDynProps,
ExamplesConfiguration.getQeueID());

      //Execution Output
      System.out.println("RESULT HASHMAP:");
      System.out.println(oRet);
      System.out.println("COMMANDS SENT:");
      System.out.println(cliCommands.getCommandsSent());
      System.out.println("STDOUT:");
      System.out.println(cliCommands.getStdOut());
```

```
  }
}
```

To execute the example, run the following command, where <classpath> should contain all the libraries contained in the directory $ECP_LIB plus the path where these classes have been compiled. The java version must be 1.4.2.

```
java -classpath <classpath>
com.hp.spain.connection.pool.examples.DynPoolConnExample
```

3.3.3. Using Direct Connections

It is possible to bypass the ECP Service when executing a Commands Template. See Direct Connections (Not Pooled Connections) for a detailed explanation.

```
package com.hp.spain.connection.pool.examples;

import java.util.HashMap;

import com.hp.spain.connection.CLICommands;
import com.hp.spain.connection.CLIExecutionException;
import com.hp.spain.connection.ConnectionResource;
import com.hp.spain.connection.TemplateParser;
import com.hp.spain.connection.TemplateParserException;

public class DirectConnExample {

  public static void main (String[] args) throws CLIExecutionException,
TemplateParserException {
      HashMap oRet=null; //the Operation execution result
      TemplateParser parser; //the ECP Template Parser instance
      CLICommands cliCommands; //the ECP Operation Engine instance

      //ECP Template Parser instantiation and configuration
      parser=new TemplateParser();
      //Target System Data
      parser.setHostname(ExamplesConfiguration.getHostname());
      parser.setPort(ExamplesConfiguration.getPort());
      parser.setLogin(ExamplesConfiguration.getLogin());
      parser.setPassword(ExamplesConfiguration.getPassword());
      parser.setPasswordEnable(ExamplesConfiguration.getPasswordEnable());

      //ECP Operation Engine instantiation and configuration
      cliCommands =
parser.parseTemplate(ExamplesConfiguration.getTemplate());
      //Equipment and Protocol Drivers
      cliCommands.setProtocol(ExamplesConfiguration.getProtocol());

  cliCommands.setConnectionResourceClassName(ExamplesConfiguration.getConnect
ionResourceClassName());

      //Equipment Driver additional initialization parameters
      HashMap oAddParams= new HashMap();

  oAddParams.put(ConnectionResource.DefaultParameterNames.specificParameters,
ExamplesConfiguration.getAdditionalData());
```

```
      cliCommands.setEquipmentDriverAdditionalParameters(oAddParams);

      //Operation execution
      oRet=cliCommands.execute();
      //Other possible executions would have been:
      //oRet=cliCommands.executeActivation();
      //oRet=cliCommands.revert();
      //oRet=cliCommands.inverseActivation();

      //Execution Output
      System.out.println("RESULT HASHMAP:");
      System.out.println(oRet);
      System.out.println("COMMANDS SENT:");
      System.out.println(cliCommands.getCommandsSent());
      System.out.println("STDOUT:");
      System.out.println(cliCommands.getStdOut());
  }
}
```

To execute the example, run the following command, where <classpath> should contain all the libraries contained in the directory $ECP_LIB plus the path where these classes have been compiled plus the path where the Equipment Driver libraries are located. The java version must be 1.4.2.

```
java -classpath <classpath> -Dactivator.dir.config=$ECP_ETC
com.hp.spain.connection.pool.examples.DirectConnExample
```

3.4. Monitoring ECP through JMS

ECP can be monitored through JMS. JMS is a specification which defines a messaging API. Two version of the specification have been produced so far: 1.1 and the now obsolete 1.0.2b.

Depending on your system, you might have to use JMS version 1.0.2b or 1.1. For example, JBoss-4.x supports the JMS1.1 version of the specification, while JBoss-3.2.x supports JMS1.0.2b. From 3.2.8, JBoss also supports JMS1.1. If your system does not impose a JMS version, version 1.1 is recommended. JMS 1.1 is backwards-compatible that is, a JMS 1.0.2b client will work with a JMS 1.1 provider and a JMS 1.1 provider will work as a JMS 1.0.2b provider.

3.4.1. Including Additional Data in Activation JMS Messages:

JMS Activation monitoring messages won't be sent unless the client issuing the activation establishes some data to be included in the messages. When receiving the JMS messages through a JMS client, the data established by the ECP client will be received. This provides a way for the ECP client to communicate with the JMS Client. The JMS Client will typically use this information to filter the messages it will receive (see JMS Documentation for additional information on this issue).

The following example shows how to establish the data to be sent in the messages.

```
package com.hp.spain.connection.pool.examples;

import java.util.HashMap;
import java.util.Map;

import com.hp.spain.connection.CLICommands;
import com.hp.spain.connection.CLIExecutionException;
import com.hp.spain.connection.TemplateParser;
import com.hp.spain.connection.TemplateParserException;
```

```
import com.hp.spain.connection.configuration.ECPSendingMessageConfiguration;

public class JMSMessagesActivationExample {

  public static void main (String[] args) throws CLIExecutionException,
TemplateParserException {
      HashMap oRet=null; //the Operation execution result
      TemplateParser parser; //the ECP Template Parser instance
      CLICommands cliCommands; //the ECP Operation Engine instance

      //ECP Template Parser instantiation and configuration
      parser=new TemplateParser();

      //ECP Operation Engine instantiation and configuration
      cliCommands =
parser.parseTemplate(ExamplesConfiguration.getTemplate());

      //ECP instance
      cliCommands.setRMIHostName(ExamplesConfiguration.getECPHost());
      cliCommands.setRMIPort(ExamplesConfiguration.getECPPort());

      //Set the content to include in the JMS Monitoring messages
      Map messagesConfiguration=new HashMap(); //The messages configuration
      cliCommands.setMsgsSpecifier(messagesConfiguration); //establish the
messages configuration
      Map messagesAdditionalContents=new HashMap(); //The messages
additional data

  messagesConfiguration.put(ECPSendingMessageConfiguration.MSGSPEC_PROPID_JMS
PROPERTIES, messagesAdditionalContents); //Include the additional message
contents in the messages configuration.

      //Add the messages additional data
      messagesAdditionalContents.put("par1", new Integer(1));
      messagesAdditionalContents.put("par2", "val2");

      //Operation execution
      oRet=cliCommands.execute(ExamplesConfiguration.getPoolName(),
ExamplesConfiguration.getQeueID());

      //Execution Output
      System.out.println("RESULT HASHMAP:");
      System.out.println(oRet);
      System.out.println("COMMANDS SENT:");
      System.out.println(cliCommands.getCommandsSent());
      System.out.println("STDOUT:");
      System.out.println(cliCommands.getStdOut());
  }
}
```

3.4.2. JMS Client Dependencies

3.4.2.1. Integrating with another JMS provider

If your system does impose a JMS version (usually because it provides a JMS implementation), you will have to include the following library:

```
activemq-core-4.1.1.jar
```

The previous jar has a runtime dependency with the following jars. You may also have to include them if your system does not.

```
backport-util-concurrent-2.1.jar
commons-logging-1.1.jar
geronimo-j2ee-management_1.0_spec-1.0.jar
```

Those libraries provide the Active MQ 4.1.1 implementation of JMS, but do not include a JMS definition. As the JMS API version is imposed by your system, you should include one of your system libraries to provide the API definition. Check your system documentation to know which library to include. JBoss provides the following jars:

```
jboss-j2ee.jar
jbossall-client.jar
```

Both jars include the JMS API definition. Use whichever you find more convenient, but not both.

3.4.2.2. No other JMS provider

If your system does not impose a JMS version (it does not include at least a runtime JMS API definition), you may use the JMS API version provided by Active MQ 4.1.1. You will have to include the following library

```
apache-activemq-4.1.1.jar
```

3.4.3. JMS Client Examples

What follows is a series of examples of JMS clients which work as ECP Monitors. In those examples, the following class, simulating a configuration, is used. You will probably have some other particular way of obtaining the configuration.

```
package com.hp.spain.connection.pool.examples;

import java.util.Hashtable;

import javax.jms.Session;
import javax.naming.Context;

public class JMSClientConfiguration {

  private static final Hashtable contextEnvironment;

  private static final boolean administeredConnectionFactory;
  private static final String connectionFactoryJNDIName;
  private static final String connectionFactoryURL;

  private static final boolean transactedSession;
  private static final int acknowledgeMode;

  private static final String destinationJNDIName;
```

```
  private static final String consumerMessagesFilter;
  private static final boolean receiveLocalMessages;

  private static final long messageReceptionTimeOut;

  static {
       contextEnvironment = new Hashtable();
       contextEnvironment.put(Context.INITIAL_CONTEXT_FACTORY,
"org.apache.activemq.jndi.ActiveMQInitialContextFactory");
       contextEnvironment.put(Context.PROVIDER_URL,
"tcp://pallanthas.des.hp.es:4001");

       administeredConnectionFactory = true;
       connectionFactoryJNDIName = "TopicConnectionFactory";
       connectionFactoryURL = "tcp://pallanthas.des.hp.es:4001";

       transactedSession=false;
       acknowledgeMode = Session.AUTO_ACKNOWLEDGE;

       destinationJNDIName = "dynamicTopics/ECP.MainTopic";

       consumerMessagesFilter = null;
       receiveLocalMessages = true;

       messageReceptionTimeOut = 10000;
  }

  public static String getConsumerMessagesFilter() {
       return consumerMessagesFilter;
  }

  public static boolean isReceiveLocalMessages() {
       return receiveLocalMessages;
  }

  public static boolean isAdministeredConnectionFactory() {
       return administeredConnectionFactory;
  }

  public static String getConnectionFactoryJNDIName() {
       return connectionFactoryJNDIName;
  }

  public static String getConnectionFactoryURL() {
       return connectionFactoryURL;
  }

  public static Hashtable getContextEnvironment() {
       return contextEnvironment;
  }

  public static int getAcknowledgeMode() {
       return acknowledgeMode;
  }

  public static boolean isTransactedSession() {
```

```
        return transactedSession;
    }

    public static String getDestinationJNDIName() {
        return destinationJNDIName;
    }

    public static long getMessageReceptionTimeOut() {
        return messageReceptionTimeOut;
    }
};
```

3.4.3.1. JMS 1.0.2b Client Example

```
package com.hp.spain.connection.pool.examples;

import javax.jms.MapMessage;
import javax.jms.Topic;
import javax.jms.TopicConnection;
import javax.jms.TopicConnectionFactory;
import javax.jms.TopicSession;
import javax.jms.TopicSubscriber;
import javax.naming.InitialContext;

public class JMS102bClient {
    public static void main(String[] args) throws Exception{
        InitialContext context;
        TopicConnectionFactory connectionFactory;
        TopicConnection connection;
        TopicSession session;
        Topic destination;
        TopicSubscriber messageConsumer;
        MapMessage message;

        //naming context for administered objects
        context = new
InitialContext(JMSClientConfiguration.getContextEnvironment());

        //the connection factory is obtained
        connectionFactory = (TopicConnectionFactory)
context.lookup(JMSClientConfiguration.getConnectionFactoryJNDIName());

        //the connection is created
        connection = connectionFactory.createTopicConnection();
        //the session is craeted
        session =
connection.createTopicSession(JMSClientConfiguration.isTransactedSession(),
JMSClientConfiguration.getAcknowledgeMode());

        //the destination is obtained
        destination = (Topic)
context.lookup(JMSClientConfiguration.getDestinationJNDIName());

        //the message receiver is created
        messageConsumer = session.createSubscriber(destination,
JMSClientConfiguration.getConsumerMessagesFilter(),
JMSClientConfiguration.isReceiveLocalMessages());
```

```
      //start to receive messages
      connection.start();

      //wait for a message
      System.out.println("Waiting for message.");
      message= null;
      message=
(MapMessage)messageConsumer.receive(JMSClientConfiguration.getMessageRecepti
onTimeOut());
      if (message!=null){
            //process the message
            System.out.println("Received message: " + message.toString());

            //acknowledge the message.
            //Acknowledging a consumed message acknowledges all messages
that the session has consumed.
            //This call can be omitted for both transacted sessions and
sessions specified to use implicit
            //acknowledgement modes. However, extra care must be taken when
omitting message
            //acknowledgement as messages that have been received but not
acknowledged may be redelivered.
            //Additionally, when client acknowledgment mode is used, a
client may build up a large number
            //of unacknowledged messages while attempting to process them.
            //This call can be made before processing the message, if
message losses are tolerated.
            message.acknowledge();
      }
      else {
            System.out.println("No message was received.");
      }

      //clean up
      messageConsumer.close();
      connection.stop();
      session.close();
      connection.close();

      System.out.println("FINISHED.");
  }
}
```

3.4.3.2. JMS 1.1 Client Example

```
package com.hp.spain.connection.pool.examples;

import javax.jms.Connection;
import javax.jms.ConnectionFactory;
import javax.jms.Destination;
import javax.jms.MapMessage;
import javax.jms.MessageConsumer;
import javax.jms.Session;
import javax.naming.InitialContext;

public class JMS11Client {
```

```
  public static void main(String[] args) throws Exception{
      InitialContext context;
      ConnectionFactory connectionFactory;
      Connection connection;
      Session session;
      Destination destination;
      MessageConsumer messageConsumer;
      MapMessage message;

      //naming context for administered objects
      context = new
InitialContext(JMSClientConfiguration.getContextEnvironment());

      //the connection factory is obtained
      connectionFactory = (ConnectionFactory)
context.lookup(JMSClientConfiguration.getConnectionFactoryJNDIName());

      //the connection is created
      connection = connectionFactory.createConnection();
      //the session is craeted
      session =
connection.createSession(JMSClientConfiguration.isTransactedSession(),
JMSClientConfiguration.getAcknowledgeMode());

      //the destination is obtained
      destination = (Destination)
context.lookup(JMSClientConfiguration.getDestinationJNDIName());

      //the message receiver is created
      messageConsumer = session.createConsumer(destination,
JMSClientConfiguration.getConsumerMessagesFilter(),
JMSClientConfiguration.isReceiveLocalMessages());

      //start to receive messages
      connection.start();

      //wait for a message
      System.out.println("Waiting for message.");
      message= null;
      message=
(MapMessage)messageConsumer.receive(JMSClientConfiguration.getMessageRecepti
onTimeOut());
      if (message!=null){
            //process the message
            System.out.println("Received message: " + message.toString());

            //acknowledge the message.
            //Acknowledging a consumed message acknowledges all messages
that the session has consumed.
            //This call can be omitted for both transacted sessions and
sessions specified to use implicit
            //acknowledgement modes. However, extra care must be taken when
omitting message
            //acknowledgement as messages that have been received but not
acknowledged may be redelivered.
            //Additionally, when client acknowledgment mode is used, a
client may build up a large number
            //of unacknowledged messages while attempting to process them.
```

```
            //This call can be made before processing the message, if
message losses are tolerated.
            message.acknowledge();
      }
      else {
            System.out.println("No message was received.");
      }

      //clean up
      messageConsumer.close();
      connection.stop();
      session.close();
      connection.close();

      System.out.println("FINISHED.");
  }
}
```

3.4.3.3. Processing Additional Data Included In Activation JMS Messages

When processing a JMS message, the additional data included by the client who issued the activation can be extracted by the JMS Client. The additional data is contained as named values inside the `MapMessage`. Extracting the data is a simple process:

```
message.getString("par");
```

3.4.4. ECP Messages Types

To ease client implementation, JMS provides the means to filter the messages that a `MessageConsumer/TopicSubscriber` will receive. See the JMS documentation for further details.

ECP Messages will always be instances of `MapMessage`.

All messages will contain a Header Property, with the name

```
com.hp.spain.connection.monitor.messages.ECPMessage.EventIDField.Name
```

and whose value will identify the type of message. The information available in a message will vary, depending on the type of message.

3.4.4.1. DataSent Message

If the message header property of name

```
com.hp.spain.connection.monitor.messages.ECPMessage.EventIDField.Name
```

has the value

```
com.hp.spain.connection.monitor.messages.DataSentMessage.EventIDField.Values
.DataSent
```

the message is a DataSent Message. Than type of message will be sent every time the protocol driver is instructed to send data to the equipment.

The message header property of name

```
com.hp.spain.connection.monitor.messages.DataSentMessage.EventDataField.Name
```

will contain the data sent.

3.4.4.2. DataReceived Message

If the message header property of name

```
com.hp.spain.connection.monitor.messages.ECPMessage.EventIDField.Name
```

has the value

```
com.hp.spain.connection.monitor.messages.DataReceivedMessage.EventID.Values.
DataReceived
```

the message is a DataSent Message. Than type of message will be sent every time the protocol driver is instructed to receive data from the equipment.

The message header property of name

```
com.hp.spain.connection.monitor.messages.DataReceivedMessage.EventDataField.Name
```

will contain the data received.

4. Configuration

Some of the configuration parameters will affect multiple ECP entities. As a consequence, it is recommended to check the indicated cross references to avoid collateral effects when modifying a parameter.

4.1. Common Configuration Sources

4.1.1. ProtocolDrivers.lst File

This file will configure the ProtocolDrivers to register and use (see Protocol Drivers Manager Configuration). The `ProtocolDrivers.lst` file should be located in the path `<ecp_home>\conf` by default, being `<ecp_home>` the ECP installation directory (see ECP RMI Service Command Line Parameters). The default location may be overwritten through the system property `activator.dir.config` (see ECP RMI Service Command Line Parameters). The file specifies the protocol driver classes, containing a single string with the following syntax:

```
<protocol_driver_list>:=<protcol_driver>{<sep><protcol_driver>}
<sep>:=,|:|;
```

Where `<protocol_driver>` is the fully qualified name of the protocol driver class. It must implement `com.hp.spain.connection.ProtocolDriver`.

4.1.2. HPSA_ECPMESSAGESPATTERNS

`IDMESSAGE`: Message Identifier. Mandatory. The sequence `HPSA_ECPMESSAGESPATTERNS_SEQ` should be used to establish the values of this field.

`CONNECTIONRESOURCECLASSNAME`: Canonical name of the equipment driver class to which the pattern applies. `null` if the pattern should be applied to all the drivers (and the protocol indicated by `PROTOCOL`).

`PROTOCOL`: Identifier of the protocol to which the pattern applies. `null` if the pattern should be applied to all the protocols (and the driver indicated by `CONNECTIONRESOURCECLASSNAME`).

`TYPE`: Reserved. Always `null`. In a future this field might be use to further restrict the scope of the pattern, i.e.: failures, errors...

`RESPONSEPATTERN`: Regular expression to be used to identify the message to return and to generate that message, as defined in Java 1.4 `java.util.regex.Pattern`. If the command response matches the pattern, the message generated will contain the command response with all the matches replaced with the replacement established in `responseReplacement`. Mandatory.

`RESPONSEREPLACEMENT`: Replacement value as defined in Java 1.4 `java.util.regex.Matcher#appendReplacement(StringBuffer, String)` which will be used to replace all the matches of `responsePattern` (if any) in the generated message. Mandatory.

4.1.3. HPSA_ECPCOMMANDSPATTERNS

`IDCOMMAND`: Command Identifier. Mandatory. The sequence `HPSA_ECPCOMMANDSPATTERNS_SEQ` should be used to stablish the values of this field.

`TYPE`: Reserverd. Always `null`. In a future this field might be use to further restrict the scope of the pattern, i.e.: failures, errors...

`COMMANDPATTERN`: Regular expression to be used to identify the message to return and to generate that message, as defined in Java 1.4 `java.util.regex.Pattern`. If the associated command response is matched, the command will be matched with this pattern and all the matches (if any) will be replaced by the replacement established in `commandReplacement`. Mandatory.

`COMMANDREPLACEMENT`: Replacement value as defined in Java 1.4 `java.util.regex.Matcher#appendReplacement(StringBuffer, String)` which will be used to replace all the matches of `commandPattern` (if any) in the generated message. Mandatory.

4.1.4. HPSA_ECPMESSAGESCOMMANDS

`IDMESSAGE`: Message Identifier. Mandatory.

`IDCOMMAND`: Command Identifier. Mandatory.

4.2. ECP Lib Configuration Sources

4.2.1. ECP Lib Command Line Parameters

ECP Lib uses the following JVM command line parameters:

```
-Dactivator.dir.config=<ecp_prot_drivers_dir>
```

`<ecp_prot_drivers_dir>`: Directory where the `ProtocolDrivers.lst` file can be found. This parameter is mandatory only if direct connections are used. In other case, it is not used. See ProtocolDrivers.lst File.

4.3. ECP RMI Service Configuration Sources

4.3.1. ECP RMI Service Command Line Parameters

The command line of the ECP RMI Server JVM has the following syntax:

```
<java_exe> -server -Djava.rmi.server.codebase=file:<ecp_home>\rmi_pub
-Djava.rmi.server.logCalls=false -
Djava.rmi.server.hostname=<ecp_rmi_server_ip>
-Djava.security.policy=<ecp_home>\conf\RmiEcpService.policy -
Dactivator.dir.config=<ecp_prot_drivers_dir> -classpath <ecp_libs>
com.hp.spain.connection.pool.server.RmiEcpService
<ecp_rmi_registry_server_host> <ecp_rmi_registry_server_port> <ecp_home>
```

<java_exe>: path to the JVM executable file. Of course, it is mandatory.

<ecp_home>: ECP installation directory. This parameter is mandatory. It will be used to establish the ecp.properties and RmiEcpService.policy files location and the ProtocolDrivers.lst file default location. See ecp.properties File and ProtocolDrivers.lst File.

<ecp_rmi_server_ip>: IP of the localhost, used by the locally created stubs to access the RMI server. Used by the JVM. This parameter is mandatory.

<ecp_rmi_registry_server_host>: Host name of the host where the RMI registry is located and where the ECP RMI service object should be bound. Normally it should refer to the localhost. This parameter is mandatory.

<ecp_rmi_registry_**server_port>**: Port number where the RMI registry accepts calls and where the ECP RMI service object should be bound. This parameter is mandatory.

<ecp_libs>: all the .jar and .zip files in the directory <ecp_home>\lib. This parameter is mandatory.

<ecp_prot_drivers_dir>: Directory where the ProtocolDrivers.lst file can be found. This parameter is optional (see ProtocolDrivers.lst File).

4.3.2. ecp.properties File

The ecp.properties file should be located in the path <ecp_**home>\conf**, being <ecp_home> the ECP installation directory (See ECP RMI Service Command Line Parameters). The ecp.properties files may contain the following properties.

LOG_DIR: Logs directory. Most of the log data will be stored there. Its default value is "C:\hp\OpenView\ServiceActivator\var\log" in windows and "/var/opt/OV/ServiceActivator/log/" in HP-UX. It must end with the path separator character.This directory should exist and the user which executes the ECP RMI Service JVM must have writing permission over it. It will establish the Pool LogFilePath (see Pool Instance Specific Logging Parameters Configuration), ProtocolDriver SpyFile (see ProtocolDriver Configuration) and Configurator Appender (see Configurator Configuration).

LOG_MAX_FILE_SIZE: Will configure the RollingFileAppenders (when used) maximum file size (in bytes) before being rolled over to backup files. Its default value is 5242880 bytes (5MB). See Pool Logging Common Parameters Configuration and Configurator Configuration.

LOG_MAX_NUM_FILES: Will configure the RollingFileAppenders (when used) maximum backup index (how many backup files are kept). Its default value is 10. See Pool Logging Common Parameters Configuration and Configurator Configuration.

LOG_DATE_PATTERN: Will establish the type of Appenders used by the pools and configure the pools DailyRollingFileAppenders (when used) rolling date pattern. Its default value is null. It must be null or a valid SimpleDateFormat pattern (see http://java.sun.com/j2se/1.4.2/docs/api/java/text/SimpleDateFormat.html). See Pool Logging Common Parameters Configuration.

LOG_PATTERN: Will configure the messages pattern for the pools and the Configurator. Its default value is null. See Pool Logging Common Parameters Configuration and Configurator Configuration.

RELOAD_MAX_TIME: Will configure the subpools expiration timeout. Its default value is 0. (see PoolManager Configuration and ECP RMI Service)

MAX_REQUESTS_TO_GET_VERIFIED_RESOURCE: Will configure the maximum number of request to obtain a positively verified resource. Its default value is 1. Must be >=1. See Pool Common Parameters Configuration.

DEFAULT_QUEUE_ID: Will configure the default queue to add the resource requests to, if it is not specified or the specified queue is not found. Its default value is 1. See Pool Common Parameters Configuration.

MAX_POOLS: Will configure the maximum number of pools that can coexist simultaneously. Its default value is 0. See PoolManager Configuration.

DISPATCHER_MAX_RATE: Will configure the maximum number of connections assigned to the whole set of clients by second. Its default value is 10. See Pool Common Parameters Configuration.

RES_MGR_MAX_RATE: Will configure the maximum number of times per second that the expired resources will be finalized, the expired temporary resources deleted and the inactive resources reinitialized. Its default value is 1. See Pool Common Parameters Configuration.

REQ_MGR_MAX_RATE: Will configure the maximum number of times per second that the process of elimination and cancellation of expired resources requests will be executed. Its default value is 0.1. See Pool Common Parameters Configuration.

POOL_MGR_MAX_RATE: Will configure the number of times per second that the process of unloading dynamic expired pools will be executed. Its default value is 0.1. See PoolManager Configuration.

DYNAMIC_POOL_NOT_USED_MAX_TIME_LIFE: Will configure the default dynamic pools NotUsedMaxTimeLife. Its default value is 0. See Pool Instance Specific Parameters Configuration.

DYNAMIC_POOL_REQUEST_TIME_OUT: Will configure the dynamic pools RequestTimeout. Its default value is 0. See Pool Instance Specific Parameters Configuration.

DYNAMIC_POOL_NUM_QUEUES: Will configure the dynamic pools NumQueues. Its default value is 0. See Pool Instance Specific Parameters Configuration.

DYNAMIC_POOL_WEIGHT_QUEUES: Will configure the dynamic pools WeightQueues. Its default value is null. See Pool Instance Specific Parameters Configuration.

DYNAMIC_POOL_LOG_LEVEL: Will configure the dynamic pools LogLevel. Its default value is 0. See Pool Instance Specific Logging Parameters Configuration.

DYNAMIC_POOL_INIT_SESSIONS: Will configure the dynamic SubPools default Initsessions. Must be an integer value. If it equals 0, then, false. In other case, true. Its default value is 0. See SubPool Configuration

SubPool Instance Specific Parameters Configuration.

DYNAMIC_POOL_MAX_SESSIONS: Will configure the dynamic SubPools default MaxSessions. Its default value is 0. See SubPool Configuration

SubPool Instance Specific Parameters Configuration.

DYNAMIC_POOL_MIN_SESSIONS: Will configure the dynamic SubPools default MinSessions. Its default value is 0. See SubPool Configuration

SubPool Instance Specific Parameters Configuration.

DYNAMIC_POOL_RESOURCE_TIME_OUT: Will configure the dynamic SubPools default ResourceTimeout. Its default value is 0. See SubPool Configuration

SubPool Instance Specific Parameters Configuration.

DYNAMIC_POOL_TEMPORARY_RESOURCES_TIME_OUT: Will configure the dynamic SubPools default TemporaryResourcesTimeout. Its default value is 0. See SubPool Configuration

SubPool Instance Specific Parameters Configuration.

DB_DRIVER: Fully qualified class name of a java.sql.Driver to load and register in the JDBC DriverManager. Its default value is null. See DBManager Configuration

DB_USER: The DataBase user on whose behalf the connection is being made. Its default value is null. See DBManager Configuration

DB_PASSWORD: The DataBase user password. Its default value is null. See DBManager Configuration

DB_URL: A JDBC DataBase URL with the form: jdbc:<subprotocol>:<subname>. Its default value is null. See DBManager Configuration

ECP.Msgs.Enable: Whether de ECP should perform JMS monitoring or not. If this option is disabled, no JMS monitoring messages will be sent, and the JMS configuration parameters will be ignored. Its default value is "false".

JMSBrokerReference.broker.uri: URI of the JMS service where ECP JMS monitoring messages will be sent. Ignored if "ECP.Msgs.Enable=false". By default it will start an embedded JMS broker. Its default value is "vm\:(broker\:(tcp\://localhost\:4001)?brokerName\=EmbeddedBroker&useJmx\=true&persistent\=false&populateJMSXUserID\=false&useShutdownHook\=false&deleteAllMessagesOnStartup\=false&enableStatistics\=false)?marshal\=false".

java.naming.factory.initial: The Initial context factory for JMS Administered objects. Ignored if "ECP.Msgs.Enable=false". Its default value is "org.apache.activemq.jndi.ActiveMQInitialContextFactory".

JMSMessageBroker.dest.type: The type of the JMS destination where the ECP JMS Monitoring messages will be sent. Use "temp" to indicate a temporary Destination and "administered" to indicate an administered one. Ignored if "ECP.Msgs.Enable=false". Its default value is "administered".

JMSMessageBroker.dest.name: The JMS destination where the ECP JMS Monitoring messages will be sent. If the destination type in "JMSMessageBroker.dest.type" is temporary, any value will suffice; if the destination type in "JMSMessageBroker.dest.type" is administered, this property must contain the name under which the Destination is registered. Ignored if "ECP.Msgs.Enable=false". Its default value is "ECP.MainTopic".

4.3.3. HPSA_EQUIPMENTCONNPOOL DB Table

NAME: Will configure the static pool Name. See Pool Instance Specific Parameters Configuration.

NOTUSEDMAXTIMELIFE: Will configure the static pool NotUsedMaxTimeLife. See Pool Instance Specific Parameters Configuration.

REQUESTTIMEOUT: Will configure the static pool RequestTimeout. See Pool Instance Specific Parameters Configuration.

NUMQUEUES: Will configure the static pool NumQueues. See Pool Instance Specific Parameters Configuration.

WEIGHTQUEUES: Will configure the static pool WeightQueues. See Pool Instance Specific Parameters Configuration.

LOGFILE: Will configure the static pool LogFilePath. See Pool Instance Specific Logging Parameters Configuration

LOGLEVEL: Will configure the static pool LogLevel. See Pool Instance Specific Logging Parameters Configuration.

4.3.4. HPSA_EQUIPMENTCONNSUBPOOL DB Table

INITSESSIONS: Will configure the static subpool Initsessions. See SubPool Configuration

SubPool Instance Specific Parameters Configuration.

MAXSESSIONS: Will configure the static subpool MaxSessions. See SubPool Configuration

SubPool Instance Specific Parameters Configuration.

MINSESSIONS: Will configure the static subpool MinSessions. See SubPool Configuration

SubPool Instance Specific Parameters Configuration.

RESOURCETIMEOUT: Will configure the static subpool ResourceTimeout. See SubPool Configuration

SubPool Instance Specific Parameters Configuration.

TEMPORARYRESOURCESTIMEOUT: Will configure the static subpool TemporaryResourcesTimeout. See SubPool Configuration

SubPool Instance Specific Parameters Configuration.

NAMEPOOL: The register in the table HPSA_EQUIPMENTCONNPOOL associated with this one.

IDSUBPOOL: Will configure the static subpool Id. See SubPool Configuration

SubPool Instance Specific Parameters Configuration.

CONNECTIONRESOURCECLASSNAME: Will configure the static subpool ConnectionResourceClassName. See SubPool Configuration

SubPool Instance Specific Parameters Configuration.

IP: Will configure the static subpool EquipmentDrivers initialization parameter IP. See EquipmentDriver Initialization Parameters Configuration.

PORT: Will configure the static subpool EquipmentDrivers initialization parameter Port. See EquipmentDriver Initialization Parameters Configuration.

PROTOCOL: Will configure the static subpool EquipmentDrivers initialization parameter Protocol. See EquipmentDriver Initialization Parameters Configuration.

USERNAME: Will configure the static subpool EquipmentDrivers initialization parameter Username. See EquipmentDriver Initialization Parameters Configuration.

PASSWORD: Will configure the static subpool EquipmentDrivers initialization parameter Password. See EquipmentDriver Initialization Parameters Configuration.

PASSWORDENABLE: Will configure the static subpool EquipmentDrivers initialization parameter Passwordenable. See EquipmentDriver Initialization Parameters Configuration.

4.3.5. DynamicECPProperties Class

This class stores the configuration of a dynamic Pool and a SubPool. A dynamic Pool will always contain a single SubPool.

4.3.5.1. DynamicECPProperties Properties

vi. DynamicECPProperties Pool Properties

PoolName: Will configure the dynamic pool Name (see Pool Instance Specific Parameters Configuration) and LogFilePath (Pool Instance Specific Logging Parameters Configuration).

vii. DynamicECPProperties SubPool Properties

ConnectionResourceClassName: Will configure the dynamic subpool ConnectionResourceClassName. See SubPool Configuration

SubPool Instance Specific Parameters Configuration.

IP: Will configure the dynamic subpool EquipmentDrivers initialization parameter Ip. See EquipmentDriver Initialization Parameters Configuration.

Port: Will configure the dynamic subpool EquipmentDrivers initialization parameter Port. See EquipmentDriver Initialization Parameters Configuration.

Protocol: Will configure the dynamic subpool EquipmentDrivers initialization parameter Protocol. See EquipmentDriver Initialization Parameters Configuration.

User: Will configure the dynamic subpool EquipmentDrivers initialization parameter Username. See EquipmentDriver Initialization Parameters Configuration.

Password: Will configure the dynamic subpool EquipmentDrivers initialization parameter Password. See EquipmentDriver Initialization Parameters Configuration.

PasswordEnable: Will configure the dynamic subpool EquipmentDrivers initialization parameter Passwordenable. See EquipmentDriver Initialization Parameters Configuration.

4.3.5.2. DynamicECPProperties Advanced Properties

viii. DynamicECPProperties Advanced Pool Properties

`NotUsedMaxTimeLife`: Will configure the pool `NotUsedMaxTimeLife`. See Pool Instance Specific Parameters Configuration.

ix. DynamicECPProperties Advanced SubPool Properties

`InitSessions`: Will configure the subpool `Initsessions`. See SubPool Configuration

SubPool Instance Specific Parameters Configuration.

`MaxSessions`: Will configure the subpool `MaxSessions`. See SubPool Configuration

SubPool Instance Specific Parameters Configuration.

`MinSessions`: Will configure the subpool `MinSessions`. See SubPool Configuration

SubPool Instance Specific Parameters Configuration.

`ResourceTimeOut`: Will configure the subpool `ResourceTimeout`. See SubPool Configuration

SubPool Instance Specific Parameters Configuration.

`TemporaryResourcesTimeOut`: Will configure the subpool `TemporaryResourcesTimeout`. See SubPool Configuration

SubPool Instance Specific Parameters Configuration.

5. Commands Template Reference

5.1. Commands Template Commands

5.1.1. Block declaration Statements

Block Declaration Statements are those which indicate the beginning or ending of a Block. The following are Block Declaration Statements.

```
[TEMPLATE:Config]
[TEMPLATE:Do]
[TEMPLATE:ErrorSection]
[TEMPLATE:Undo]
[TEMPLATE:Commit]
[TEMPLATE:Rollback]
[TEMPLATE:Section *]
```

Block Declaration Statements may include other Block Declaration Statements (depending on the containing statement) or Executable Statements. Block Declaration mainly have group of commands to be executed.

A template could start with the optional block [TEMPLATE:Config] and in this block is possible to put all the commands required to configure properly the terminal before executing any activation command.

After that, the mandatory block [TEMPLATE:Do]. This block will contains all commands to activate the service and we can divide this block in sections using the block [TEMPLATE:Section *] where "*" is a number starting from 0.

The [TEMPLATE:Undo] is the next optional tag . This block will contain all the "undo" commands that have to be executed when one of the "DO" commands fails in the reverse order. Both blocks, [TEMPLATE:Do] and [TEMPLATE_Undo] are divided using the block [TEMPLATE:Section *] and the undo block will execute only the section executed in DO. For example, if DO and UNDO have 0,1,2,3,4 and 5 sections and a command from section 4 fails the UNDO block will execute 3,2,1,0 section in this order.

The optional tag [TEMPLATE:ErrorSection] can be defined after the DO block and it can include the commands that have to be executed in one section fails. This block is useful because the UNDO section will execute only the section that have been executed properly and not the section that has been failed.

At the end o f the template, [TEMPLATE:Commit] and [TEMPLATE:Rollback] can be defined. Commit block will execute only if all DO commands have been executed properly and Rollback block will execute if some command from DO or Commit fails.

5.1.2. Executable Statements

Executable Statements are those which do not intervene in the Declaration of a Block but are included by them and define commands to be executed. They must always appear inside a Block. The executable statements are useful to execute if and loops in runtime. This means, the template is able to make decision based on conditions and these conditions could be refer to output of commands. For example, it possible to execute first "whoami" command and after that define and if where we'll execute "add user" if the output of whoami is root and "sudo add user" if the ouput of whoami is not root.

Another example using loop could be to execute "ls /directory/*.txt" command, save the output in an array and after that execute a loop where a command will be executed for each txt file.

Both, ifs and loops, are possible to nest them.

5.1.2.1. If-Else Statement

Declares two different Executable blocks to execute depending on the value of a condition. The "Else" part is optional. It is defined like this:

```
[TEMPLATE:If "<condition>"]
  <Executable Statement Block>
[TEMPLATE:Else]
  <Executable Statement Block>
[TEMPLATE:EndIf]
```

Where <condition> is any valid ECP condition and <Executable Statement Block> is a set of Executable Statements. Nested If-Else or ForEach Statements are allowed. For example:

```
[TEMPLATE:If "failed=="true""]
  help
       [TEMPLATE:EndStrPattern "admin#"]
  exit
       [TEMPLATE:EndStrPattern "admin#"]
[TEMPLATE:EndIf]
```

Or with an else clause:

```
[TEMPLATE:If "failed=="true""]
  help
       [TEMPLATE:EndStrPattern "admin#"]
[TEMPLATE:Else]
  telnet 127.0.0.1 1234
       [TEMPLATE:EndStrPattern "admin#"]
[TEMPLATE:EndIf]
```

5.1.2.2. ForEach Statement

Declares an Executable block to be executed once for every element of an Array Variable. It is defined like this:

```
[TEMPLATE:ForEach "<variableID>" In "<arrayVariableID>"]
  <Executable Statement Block>
[TEMPLATE:EndFor]
```

Where <variableID> is any valid ECP variable identifier, <arrayVariableID> is any valid ECP array variable identifier and <Executable Statement Block> is a set of Executable Statements.

On each loop, the variable <variableID> will contain a different value in <arrayVariableID> and its values will be in the same order as in <arrayVariableID>. Nested If-Else or ForEach Statements are allowed. For example:

```
[TEMPLATE:ForEach "var" In " destinationIPs"]
  ping  %var% -n 1
       [TEMPLATE:EndStrPattern "admin#"]
```

```
[TEMPLATE:EndFor]
```

5.1.3. Command Statements

Command Statements are those which define how a command must be issued and its output processed. Therefore, next tags can be declared after any command. These tags define errors, failures, variables that will containg certain value from the output command, force to save the full output to a file and so on. The following are the full Command Statements list:

```
[TEMPLATE:ErrorMessage “*”]
[TEMPLATE:NonError “*”]
[TEMPLATE:NonErrorPattern “*”]
[TEMPLATE:Error “*”]
[TEMPLATE:Failure “*”]
[TEMPLATE:EndStr “*”]
[TEMPLATE:EndStrPattern “*”]
[TEMPLATE:Secret]
[TEMPLATE:Echo]
[TEMPLATE:EndParamString “*”]
[TEMPLATE:EndCommandString “*”]
[TEMPLATE:Question “*” Response “*”]
[TEMPLATE:Pattern “*”]
[TEMPLATE:Condition “*”]
[TEMPLATE:ExecuteUntil “*”]
[TEMPLATE:CommandDelay “*”]
[TEMPLATE:ReadAttemps “*”]
[TEMPLATE:ErrorPattern \"*\"]
[TEMPLATE:FailurePattern \"*\"]
[TEMPLATE:Variable “*”]
[TEMPLATE:Array “*”]
[TEMPLATE:ExecuteUntilDelay “*”]
[TEMPLATE:ExecuteUntilAttempts “*”]
[TEMPLATE:Filename  “*”]
[TEMPLATE:Filename  “*” Option “*”]
```

5.1.4. Configuration Statements

Configuration statements are defined in the Config block to define default behavior to the full template. For example, the EndStrPattern is usually the same value for all command and the template can define the default end string pattern using the tag [TEMPLATE:DefaultEndStrPattern].

```
[TEMPLATE:DefaultDelay “*”]
[TEMPLATE:DefaultReadAttemps “*”]
[TEMPLATE:DefaultEndParamString “*”]
[TEMPLATE:DefaultEndCommandString “*”]

[TEMPLATE:DefaultError “*”]
[TEMPLATE:DefaultNonError “*”]
[TEMPLATE:DefaultNonErrorPattern “*”]
[TEMPLATE:DefaultEndStr “*”]
[TEMPLATE:DefaultEndStrPattern “*”]
[TEMPLATE:DefaultEcho]
```

5.2. Commands Reference

5.2.1. Commands List

Token	Explanation
!<comment>	Comments lines stars with ! character and comments will be ingnore by the ECP engine
[TEMPLATE:DefaultDelay "*"]	This value will introduce a delay before executing any command. The value is defined in milliseconds.
[TEMPLATE:DefaultReadAttemps "*"]	When a command is executed the ECP engine try to read the output until it gets the end string. This value define the maximum number of read with no answer that ECP egine can execute.
[TEMPLATE:DefaultEndParamString "*"]	Some commands make a question after executing the command. This tag is the default value to append to the question responses.
[TEMPLATE:DefaultEndCommandString "*"]	This value will be append to every command.
[TEMPLATE:DefaultError "*"]	An error define is the command has not been executed properly. This tag define a default error that will be apply to all commands in the template.
[TEMPLATE:DefaultNonError "*"]	In case a error is detected it's possible to define exceptions. For example, if the output is ERROR: user already exist but in this case the template should not return an error, a NonError can be defined. This NonError will be executed to all commands. This doesn't apply for failures.
[TEMPLATE:DefaultNonErrorPattern "*"]	Same behaviour than DefaultNonError but in this case using Regural Expresion Pattern
[TEMPLATE:DefaultEndStr "*"]	After execute a command it's mandatory to find a string that define the end of the command. This string is usually the prompt. This tag define the default end string applied to all commands.
[TEMPLATE:DefaultEndStrPattern "*"]	Same behaviour than DefaultEndString but using Regular Expression Pattern.
[TEMPLATE:DefaultEcho]	Target System will echo, treat it as ifs never arrived on every command by default
[TEMPLATE:Config]	Declares the begining of a Config Block. This block contains the command to configure the terminal before executing any activation command.
[TEMPLATE:Do]	Declares the begining of a Do Block. This block contains the activation commands.
[TEMPLATE:ErrorSection]	Declares the begining of an Error Block. This block contains the commands to execute in case a section fails.
[TEMPLATE:Undo]	Declares the begining of an Undo Block. This block contains the rollback commands to executed in case the DO block fails.
[TEMPLATE:Commit]	Declares the begining of an Commit Block. This block contains the commit commands to be executed after DO section in case DO block works.
[TEMPLATE:Rollback]	Declares the begining of an Rollback Block. This block contains the rollback commands to execute after the UNDO section in case the DO section fails or even after Commit section if it fails.
[TEMPLATE:Section *]	Declares the begining of an Section Block. DO and UNDO are divided in sections to group commands.

<commandcommand>

[TEMPLATE:AssignVariable "*"]	Assigns a constant value to a variable.
[TEMPLATE:If "*"]	Declares an Executable block to execute if the condition is true. The condition can use variable fromused in the template.
[TEMPLATE:Else]	Declares an Executable block to execute if the corresponding if condition is false
[TEMPLATE:EndIf]	Declares de end of an if or else executable block
[TEMPLATE:ForEach "*" In "*"]	Declares an Executable block to be executed once for every element of an Array Variable
[TEMPLATE:EndFor]	Declares de end of a forEach executable block
[TEMPLATE:ErrorMessage "*"]	An error message to be sent to the ECP client if an error is encountered
[TEMPLATE:NonError "*"]	Pattern to ignore on error search (not on failure search)
[TEMPLATE:NonErrorPattern "*"]	Regural Expresion Pattern to ignore on error search (not on failure search)
[TEMPLATE:Error "*"]	Pattern to interpret as the command returning an error (and wait for command response end string)
[TEMPLATE:Failure "*"]	Pattern to interpret as the command returning a failure (and do not wait for command response end string)
[TEMPLATE:EndStr "*"]	Pattern to interpret as the end of the command execution
[TEMPLATE:EndStrPattern "*"]	Regular Expression Pattern to interpret as the end of the command execution
[TEMPLATE:Secret]	Do not trace the issued command (useful for passwords because it avoid to be printed in the log files)
[TEMPLATE:Echo]	Target System will echo, treat it as ifs never arrived
[TEMPLATE:EndParamString "*"]	String to append to the question responses
[TEMPLATE:EndCommandString "*"]	String to append to the command
[TEMPLATE:Question "*" Response "*"]	The command is interactive. If the Pattern is found, send that response
[TEMPLATE:Pattern "*"]	Store every ocurrence of the group in the regular expresion in a position of the array variables which follow
[TEMPLATE:Condition "*"]	Only issue the command if the condition is satisfied
[TEMPLATE:CommandDelay "*"]	Wait that number of milliseconds before executing the command
[TEMPLATE:ReadAttemps "*"]	When a command is executed the ECP engine try to read the output until it gets the end string. This value define the maximum number of read with no answer that ECP egine can execute
[TEMPLATE:ErrorPattern \"*\"]	Regular Expresion Pattern to interpret as the command returning an error
[TEMPLATE:FailurePattern \"*\"]	Regular Expresion Pattern to interpret as the command returning a failure
[TEMPLATE:Variable "*"]	Variable where to store the ocurrence of the Pattern. The pattern will capture a particular string from the output and the value will be save in this variable. The variable can be used in other commands using the % symbol. For example, add user %name%.
[TEMPLATE:Array "*"]	Array variable where to store the occurence.s. To access to a single position next is the format name[position]
[TEMPLATE:ExecuteUntil "*"]	Execute the command until the condition is satisfied. This command is very useful when the server sometimes doesn't work at the first time and it will work after some retries.

[TEMPLATE:ExecuteUntilDelay "*"]	Wait that number of milliseconds before issueing the command on every iteration
[TEMPLATE:ExecuteUntilAttempts "*"]	If that number of iterations is exceeded, ignore condition and exit loop
[TEMPLATE:Filename "*"]	Save the ouput to the file
[TEMPLATE:Filename "*" Option "*"]	Save the ouput to the file. Options can be bigouput to true/false , tail and grep. The format to define options are bigouput=false;tail=100;grep=100. When output are really big is almost mandatory to define bigoutput to true because if not the ECP could trhow an OutOfMemory.

5.2.2. Commands Syntax

Token	Unique in Context	Precedes to Token (and)	Follows to Token (or)	Nested to Token	Mutually exclusive with Token
!<comment>					
[TEMPLATE:DefaultDelay "*"]	Yes	[TEMPLATE:Config]			
[TEMPLATE:DefaultReadAttemps "*"]		[TEMPLATE:Config]			
[TEMPLATE:DefaultEndParamString "*"]	Yes	[TEMPLATE:Config]			
[TEMPLATE:DefaultEndCommandString "*"]	Yes	[TEMPLATE:Config]			
[TEMPLATE:DefaultError "*"]		[TEMPLATE:Config]			[TEMPLATE:DefaultErrorNull]
[TEMPLATE:DefaultNonError "*"]		[TEMPLATE:Config]			[TEMPLATE:DefaultNonErrorNull]
[TEMPLATE:DefaultNonErrorPattern "*"]		[TEMPLATE:Config]			[TEMPLATE:DefaultNonErrorPatternNull]
[TEMPLATE:DefaultEndStr "*"]		[TEMPLATE:Config]			[TEMPLATE:DefaultEndStrNull]
[TEMPLATE:DefaultEndStrPattern "*"]		[TEMPLATE:Config]			[TEMPLATE:DefaultEndStrPatternNull]
[TEMPLATE:DefaultEcho]		[TEMPLATE:Config]			
[TEMPLATE:Config]	Yes	[TEMPLATE:Do] [TEMPLATE:ErrorSection] [TEMPLATE:ErrorSection FinalCommand] [TEMPLATE:Undo] [TEMPLATE:Commit] [TEMPLATE:Commit FinalCommit] [TEMPLATE:Rollback] [TEMPLATE:Rollback FinalRollback] [TEMPLATE:Exit] [TEMPLATE:Exit FinalExit]			[TEMPLATE:Config FinalConfig]
[TEMPLATE:Do]	Yes				

[TEMPLATE:ErrorSection]	Yes	[TEMPLATE:Do]	[TEMPLATE:ErrorSection FinalCommand]
[TEMPLATE:Undo]	Yes	[TEMPLATE:Do] [TEMPLATE:ErrorSection]	
[TEMPLATE:Commit]		[TEMPLATE:Undo]	
[TEMPLATE:Rollback]		[TEMPLATE:Undo] [TEMPLATE:Commit] [TEMPLATE:Commit FinalCommit]	
[TEMPLATE:Section *]			[TEMPLATE:Do] [TEMPLATE:Undo]
<commandcommand>			[TEMPLATE:Config] [TEMPLATE:Config FinalConfig] [TEMPLATE:ErrorSection] [TEMPLATE:ErrorSection FinalCommand] [TEMPLATE:Commit] [TEMPLATE:Commit FinalCommit] [TEMPLATE:Rollback] [TEMPLATE:Rollback FinalRollback] [TEMPLATE:Exit] [TEMPLATE:Exit FinalExit] [TEMPLATE:Do]/[TEMPLATE:Section *] [TEMPLATE:Undo]/[TEMPLATE:Section *]
[TEMPLATE:AssignVariable “*”]			idem <command>
[TEMPLATE:If "*"]			idem <command>
[TEMPLATE:Else]			idem <command>
[TEMPLATE:EndIf]			idem <command>
[TEMPLATE:ForEach "*" In "*"]			idem <command>
[TEMPLATE:EndFor]			idem <command>
[TEMPLATE:ErrorMessage “*”]			<command>
[TEMPLATE:NonError “*”]			<command>
[TEMPLATE:NonErrorPattern “*”]			<command>
[TEMPLATE:Error “*”]			<command>
[TEMPLATE:Failure “*”]			<command>
[TEMPLATE:EndStr “*”]			<command>
[TEMPLATE:EndStrPattern “*”]			<command>
[TEMPLATE:Secret]			<command>
[TEMPLATE:Echo]			<command>
[TEMPLATE:EndParamString “*”]			<command>
[TEMPLATE:EndCommandString “*”]			<command>
[TEMPLATE:Question “*” Response “*”]			<command>

[TEMPLATE:Pattern “*”]	<command>
[TEMPLATE:Condition “*”]	<command>
[TEMPLATE:ExecuteUntil “*”]	<command>
[TEMPLATE:CommandDelay “*”]	<command>
[TEMPLATE:ReadAttemps “*”]	<command>
[TEMPLATE:ErrorPattern \"*\"]	<command>
[TEMPLATE:FailurePattern \"*\"]	<command>
[TEMPLATE:Variable “*”]	[TEMPLATE:Pattern “*”]
[TEMPLATE:Array “*”]	[TEMPLATE:Pattern “*”]
[TEMPLATE:ExecuteUntilDelay “*”]	[TEMPLATE:ExecuteUntil “*”]
[TEMPLATE:ExecuteUntilAttempts “*”]	[TEMPLATE:ExecuteUntil “*”]

6. Configuration Quick Reference

6.1. DBManager Configuration

`Driver`: A java.sql.Driver to load (through a Class.forName()) for it to be registered in the JDBC `DriverManager`. The class must exist and be in the classpath. Established from the ecp.properties `DB_DRIVER` property (see ecp.properties File).

`User`: The DataBase user on whose behalf the connection is being made. Established from the ecp.properties `DB_USER` property (see ecp.properties File).

`Password`: The DataBase user password. Established from the ecp.properties `DB_PASSWORD` property (see ecp.properties File).

`URL`: A JDBC URL String in the form "`jdbc:<subprotocol>:<subname>`". Established from the ecp.properties `DB_URL` property (see ecp.properties File).

6.2. Configurator Configuration

The following parameters of the `Configurator` may be established:

`Appender`: The `Configurator Appender` properties (except for the file name which is fixed) may be configured from the ecp.properties `LOG_DIR`, `LOG_MAX_FILE_SIZE` and `LOG_MAX_NUM_FILES` properties (see ecp.properties File).

The `Configurator` will use a `RollingFileAppender` as `Appender`. Its maximum file size and maximum number of files will be the values specified by `LOG_MAX_FILE_SIZE` and `LOG_MAX_NUM_FILES` respectively. The **Configurator** log file will be located at `LOG_DIR` + "`Configurator.log`". See ecp.properties File.

`Pattern`: Established from the `ecp.properties LOG_PATTERN` property (see ecp.properties File). It will configure the log messages format pattern of the `Configurator`. Its valid values may be:

```
null
ISO8601
```

A valid `PatternLayout`'s pattern.

If the pattern is `null` or "`ISO8601`" a `TTCCLayout` will be used as the `Appender Layout`. In other case, a `PatternLayout` with specified value will be used. See
http://logging.apache.org/log4j/1.2/apidocs/org/apache/log4j/TTCCLayout.html

http://logging.apache.org/log4j/1.2/apidocs/org/apache/log4j/PatternLayout.html

6.3. ECP RMI Service

`reloadSubPool`: On a `reloadSubPool` call, the timeout given to the whole set of the BUSY resources of the subpool before forcing their finalization can be configured through the `ecp.properties` file `RELOAD_MAX_TIME` property. If its value is ==0, the process will wait until the resources are not BUSY. See ecp.properties File.

`lockSubPool`: On a `lockSubPool` call, the timeout given to the whole set of the BUSY resources of the subpool before forcing their finalization can be configured through the `ecp.properties` file `RELOAD_MAX_TIME` property. If its value is <=0, no timeout will be given. See ecp.properties File.

`lockPool`: On a `lockPool` call, the timeout given to the whole set of the BUSY resources of each subpool before forcing their finalization can be configured through the `ecp.properties` file `RELOAD_MAX_TIME` property. If its value is <=0, no timeout will be given. See ecp.properties File.

`unloadPool`: On a unload`Pool` call, the timeout given to the whole set of the BUSY resources of each subpool before forcing their finalization can be configured through the `ecp.properties` file `RELOAD_MAX_TIME` property. If its value is <=0, no timeout will be given. See ecp.properties File.

6.4. PoolManager Configuration

`Pool Expiration`: When a (not BUSY) pool expires and is unloaded, the timeout in milliseconds given to each subpool for its BUSY resources before forcing their finalization can be configured through the `ecp.properties` file `RELOAD_MAX_TIME` property. If its value is 0, no timeout will be given. See ecp.properties File.

`MaxPools`: The maximum number of pools that can coexist simultaneously can be configured through the `ecp.properties` file `MAX_POOLS` property. If its value is `0`, no limit will be established. See ecp.properties File.

`PoolCleanUp`: The number of times per second that the process of unloading dynamic expired pools will be executed can be configured through the `ecp.properties` file `POOL_MGR_MAX_RATE` property. Must be `!=0`. See ecp.properties File.

6.5. Pool Configuration

6.5.1. Pool Common Parameters Configuration

The following parameters are shared by all the pools:

getResourceRetries: The number of request to obtain a positively verified resource can be configured through the `ecp.properties` file `MAX_REQUESTS_TO_GET_VERIFIED_RESOURCE` property. See ecp.properties File.

getResourceDefaultQeueId: The default queue to add the resource request to, if it is not specified or the specified queue is not found can be configured through the `ecp.properties` file `DEFAULT_QUEUE_ID` property. See ecp.properties File.

`DispatcherMaxRate`: The maximum number of connections assigned to the whole set of clients by second can be configured through the `ecp.properties` file `DISPATCHER_MAX_RATE` property. Must be `!=0`. See ecp.properties File.

`ResourcesCleanUp`: The maximum number of times per second that the expired resources will be finalized, the expired temporary resources deleted and the inactive resources reinitialized can be configured through the `ecp.properties` file `RES_MGR_MAX_RATE` property. Must be `!=0`. See ecp.properties File.

`RequestsCleanUp`: The maximum number of times per second that the process of elimination and cancellation of expired resources requests will be executed can be configured through the `ecp.properties` file `REQ_MGR_MAX_RATE` property. Must be `!=0`. See ecp.properties File.

6.5.1.1. Pool Logging Common Parameters Configuration

`Appender`: Each pool will have its own `Appender`, but the `Appenders` properties and types are common, except for the file path (`LogFile`) which is specific for each pool, see Pool Instance Specific Logging Parameters Configuration.The pools `Appenders` types and properties may be configured from the ecp.properties `LOG_MAX_FILE_SIZE`, `LOG_MAX_NUM_FILES` and `LOG_DATE_PATTERN` properties (see ecp.properties File).

If `LOG_DATE_PATTERN` is `null`, then a `RollingFileAppender` will be used. In other case, a `DailyRollingFileAppender` will be used. If a `DailyRollingFileAppender` is used, its rolling date pattern will be the value specified by `LOG_DATE_PATTERN`. If a `RollingFileAppender` is used, its maximum file size and maximum number of files will be the values specified by `LOG_MAX_FILE_SIZE` and `LOG_MAX_NUM_FILES` respectively. See ecp.properties File. Notice that each SubPool will use the logger of the pool it belongs to, to log its messages (see SubPool Instance Specific Logging Parameters Configuration)

`Pattern`: Established from the ecp.properties LOG_PATTERN property (see ecp.properties File). Will configure the pools log messages format pattern. Its valid values may be:

```
null
ISO8601
```

A valid `PatternLayout`'s pattern.

If the pattern is `null` or "`ISO8601`" a `TTCCLayout` will be used as the `Appender Layout`. In other case, a `PatternLayout` with specified value will be used. See
http://logging.apache.org/log4j/1.2/apidocs/org/apache/log4j/TTCCLayout.html

http://logging.apache.org/log4j/1.2/apidocs/org/apache/log4j/PatternLayout.html

Notice that each SubPool will use the logger of the pool it belongs to, to log its messages (see SubPool Instance Specific Logging Parameters Configuration)

6.5.2. Pool Instance Specific Parameters Configuration

`Name`: Establishes the name that will identify the pool. If the pool is dynamic, and a name has been set (see DynamicECPProperties Pool Properties) the value of this parameter will be

```
PoolName  + "-" + user + "-" + ip + "-" + port
```

If a name has not been set, the value of this parameter will be

```
"DYNAMIC" + "-" + user + "-" + ip + "-" + port
```

If the pool is static, the value of this parameter will be specified by the `HPSA_EQUIPMENTCONNPOOL NAME` DB field (see HPSA_EQUIPMENTCONNPOOL DB Table).

`NotUsedMaxTimeLife`: Establishes the maximum time that a pool may remain unused. Once that time has expired, it will be removed. The timer is reset on each Operation (execute, executeActivation, inverseActivation, revert). If the pool is dynamic, and the advanced dynamic properties are set (see DynamicECPProperties Advanced Properties) the value of this parameter will be specified by the DynamicECPProperties NotUsedMaxTimeLife attribute (see DynamicECPProperties Advanced Pool Properties). If the advanced dynamic properties are not set, the value of this parameter will be specified by the the ecp.properties DYNAMIC_POOL_NOT_USED_MAX_TIME_LIFE property (see ecp.properties File). If the pool is static, the value of this parameter will be specified by the HPSA_EQUIPMENTCONNPOOL NOTUSEDMAXTIMELIFE DB field (see HPSA_EQUIPMENTCONNPOOL DB Table).

RequestTimeout: Maximum time to wait when obtaining a connection on a client request.

If the pool is dynamic, the value of this parameter will be specified by the `ecp.properties DYNAMIC_POOL_REQUEST_TIME_OUT` property (see ecp.properties File). If the pool is static, the value of this parameter will be specified by the `HPSA_EQUIPMENTCONNPOOL REQUESTTIMEOUT` DB field (see HPSA_EQUIPMENTCONNPOOL DB Table).

`NumQueues`: Number of request queues to add to the pool. Its value must be coherent with the value specified in WeightQueues.

If the pool is dynamic, the value of this parameter will be specified by the `ecp.properties` `DYNAMIC_POOL_NUM_QUEUES` property (see ecp.properties File). If the pool is static, the value of this parameter will be specified by the `HPSA_EQUIPMENTCONNPOOL NUMQUEUES` DB field (see HPSA_EQUIPMENTCONNPOOL DB Table).

`WeightQueues`: Priority of each request queue. The number of request queues specified in NumQueues will be created with the specified corresponding weights and order, and with the ids from 1 to NumQueues. It must not be null, and must have the format:

```
<weight_queues>:=<queue_weight>{<sep><queue_weight>}
<sep>:=,
```

Where `<queue_weight>` is a number specifying the weight of the queue. The higher the weight, the higher the priority of the queue.

If the pool is dynamic, the value of this parameter will be specified by the `ecp.properties` `DYNAMIC_POOL_WEIGHT_QUEUES` property (see ecp.properties File). If the pool is static, the value of this parameter will be specified by the `HPSA_EQUIPMENTCONNPOOL WEIGHTQUEUES` DB field (see HPSA_EQUIPMENTCONNPOOL DB Table).

6.5.2.1. Pool Instance Specific Logging Parameters Configuration

`LogLevel`: The pool logger level. Should be an integer value. If the log message level value is greater or equal than the log level, the message will be written. The numerical values of the log4j log levels are:

```
FATAL = 50000
ERROR = 40000
WARN = 30000
INFO = 20000
DEBUG = 10000
ALL = Integer.MIN_VALUE
```

If the pool is dynamic, the value of this parameter will be specified by the `ecp.properties` `DYNAMIC_POOL_LOG_LEVEL` property (see ecp.properties File). If the pool is static, the value of this parameter will be specified by the `HPSA_EQUIPMENTCONNPOOL LOGLEVEL` DB field (see HPSA_EQUIPMENTCONNPOOL DB Table).

Notice that each SubPool will use the logger of the pool it belongs to to log its messages (see SubPool Instance Specific Logging Parameters Configuration)

`LogFilePath`: Determines the file where the pool instance log will be written. The file will be created in the directory specified by the ecp.properties `LOG_DIR` property.

If the pool is dynamic, the `LogFilePath` will be

```
LOG_DIR + Pool.Name +  ".log"
```

If the pool is static, the `LogFilePath` will be specified by the `HPSA_EQUIPMENTCONNPOOL LOGFILE` field (see HPSA_EQUIPMENTCONNPOOL DB Table).

```
LOG_DIR + LOGFILE
```

Notice that each SubPool will use the logger of the pool it belongs to to log its messages (see SubPool Instance Specific Logging Parameters Configuration)

6.6. SubPool Configuration

6.6.1. SubPool Instance Specific Parameters Configuration

`Initsessions`: Determines whether the resources should be initialized as soon as created (or reused) or the SubPool should wait until the resource is requested by the client.

If the subpool is dynamic, and the advanced dynamic properties are set (see DynamicECPProperties Advanced Properties) the value of this parameter will be specified by the DynamicECPProperties `InitSessions` attribute (see DynamicECPProperties Advanced SubPool Properties). If the advanced dynamic properties are not set, the value of this parameter will be specified by the the `ecp.properties DYNAMIC_POOL_INIT_SESSIONS` property (see ecp.properties File). If the pool is static, the value of this parameter will be specified by the `HPSA_EQUIPMENTCONNSUBPOOL INITSESSIONS` DB field (see HPSA_EQUIPMENTCONNSUBPOOL DB Table).

`MaxSessions`: Maximum number of resources that the SubPool will contain. Resources will be allocated as needed, but existent resources will be reused if possible.

If the subpool is dynamic, and the advanced dynamic properties are set (see DynamicECPProperties Advanced Properties) the value of this parameter will be specified by the DynamicECPProperties `InitSessions` attribute (see DynamicECPProperties Advanced SubPool Properties). If the advanced dynamic properties are not set, the value of this parameter will be specified by the the `ecp.properties DYNAMIC_POOL_MAX_SESSIONS` property (see ecp.properties File). If the pool is static, the value of this parameter will be specified by the `HPSA_EQUIPMENTCONNSUBPOOL MAXSESSIONS` DB field (see HPSA_EQUIPMENTCONNSUBPOOL DB Table).

`MinSessions`: Minimum number of resources to keep instantiated in the SubPool. The SubPool will always contain at least that quantity of resources.

If the subpool is dynamic, and the advanced dynamic properties are set (see DynamicECPProperties Advanced Properties) the value of this parameter will be specified by the DynamicECPProperties `InitSessions` attribute (see DynamicECPProperties Advanced SubPool Properties). If the advanced

dynamic properties are not set, the value of this parameter will be specified by the the ecp.properties DYNAMIC_POOL_MIN_SESSIONS property (see ecp.properties File). If the pool is static, the value of this parameter will be specified by the HPSA_EQUIPMENTCONNSUBPOOL MINSESSIONS DB field (see HPSA_EQUIPMENTCONNSUBPOOL DB Table).

ResourceTimeout: Maximum time that a resource is allowed to remain BUSY (in use by a client). Once the timeout has expired the resource remains BUSY, the resource will be finalized (and eventually reinitialized and reassigned to other client).

If the subpool is dynamic, and the advanced dynamic properties are set (see DynamicECPProperties Advanced Properties) the value of this parameter will be specified by the DynamicECPProperties InitSessions attribute (see DynamicECPProperties Advanced SubPool Properties). If the advanced dynamic properties are not set, the value of this parameter will be specified by the the ecp.properties DYNAMIC_POOL_RESOURCE_TIME_OUT property (see ecp.properties File). If the pool is static, the value of this parameter will be specified by the HPSA_EQUIPMENTCONNSUBPOOL RESOURCETIMEOUT DB field (see HPSA_EQUIPMENTCONNSUBPOOL DB Table).

TemporaryResourcesTimeout: Maximum time that a temporary connection can remain unused after it is created, in milliseconds. If the timeout is set to 0, it will never expire. Once the timeout has expired the temporary connection will be finalized and destroyed. Temporary connections are the additional connections to MinSessions. Expired temporary connections are not reused. Instead, they are finalized and destroyed after their expiration. They may be reused though, if the connection is not expired and the SubPool is reloaded or the connection closed (via RMI) and the pool contains less than MinSessions resources. Notice that Temporary connections are also affected by ResourceTimeout.

If the subpool is dynamic, and the advanced dynamic properties are set (see DynamicECPProperties Advanced Properties) the value of this parameter will be specified by the DynamicECPProperties InitSessions attribute (see DynamicECPProperties Advanced SubPool Properties). If the advanced dynamic properties are not set, the value of this parameter will be specified by the the ecp.properties DYNAMIC_POOL_TEMPORARY_RESOURCES_TIME_OUT property (see ecp.properties File). If the pool is static, the value of this parameter will be specified by the HPSA_EQUIPMENTCONNSUBPOOL TEMPORARYRESOURCESTIMEOUT DB field (see HPSA_EQUIPMENTCONNSUBPOOL DB Table).

Id: Identifier of the subpool.

If the subpool is dynamic, then the subpool identifier will be 0 (actually, the JVM initialization value of an integer, as the value is not initialized by the ECP). If the subpool is static, the value of this parameter will be specified by the HPSA_EQUIPMENTCONNSUBPOOL IDSUBPOOL DB field (see HPSA_EQUIPMENTCONNSUBPOOL DB Table).

ConnectionResourceClassName: Fully qualified class name of the EquipmentDriver to be used for this subpool connections. Must extend ConnectionResource and be in the system codebase (classpath).

If the subpool is dynamic, the value of this parameter will be specified by the DynamicECPProperties ConnectionResourceClassName attribute (see DynamicECPProperties SubPool Properties). If the subpool is static, the value of this parameter will be specified by the HPSA_EQUIPMENTCONNSUBPOOL CONNECTIONRESOURCECLASSNAME DB field (see HPSA_EQUIPMENTCONNSUBPOOL DB Table).

6.6.1.1. SubPool Instance Specific Logging Parameters Configuration

`Logger:` Each SubPool will use the logger of the pool it belongs to to log its messages (see Pool Logging Common Parameters Configuration and Pool Instance Specific Logging Parameters Configuration).

Notice that each ConnectionResource will use the logger of the SubPool it belongs to to log its messages (see ConnectionResource Configuration)

6.6.1.2. EquipmentDriver Initialization Parameters Configuration

`Ip`: Passed from the SubPool to the EquipmentDriver on construction in the Map entry key `ConnectionResource.DefaultParameterNames.host`. If the SubPool to which the EquipmentDriver belongs is dynamic, the value of this parameter will be specified by the DynamicECPProperties `IP` attribute (see DynamicECPProperties SubPool Properties). If the subpool is static, the value of this parameter will be specified by the `HPSA_EQUIPMENTCONNSUBPOOL IP` DB field (see HPSA_EQUIPMENTCONNSUBPOOL DB Table).

`Port`: Passed from the SubPool to the EquipmentDriver on construction in the Map entry key `ConnectionResource.DefaultParameterNames.port`. If the SubPool to which the EquipmentDriver belongs is dynamic, the value of this parameter will be specified by the DynamicECPProperties `Port` attribute (see DynamicECPProperties SubPool Properties). If the subpool is static, the value of this parameter will be specified by the `HPSA_EQUIPMENTCONNSUBPOOL PORT` DB field (see HPSA_EQUIPMENTCONNSUBPOOL DB Table).

`Protocol`: Passed from the SubPool to the EquipmentDriver on construction in the Map entry key `ConnectionResource.DefaultParameterNames.protocol`. If the SubPool to which the EquipmentDriver belongs is dynamic, the value of this parameter will be specified by the DynamicECPProperties `Protocol` attribute (see DynamicECPProperties SubPool Properties). If the subpool is static, the value of this parameter will be specified by the `HPSA_EQUIPMENTCONNSUBPOOL PROTOCOL` DB field (see HPSA_EQUIPMENTCONNSUBPOOL DB Table). The value identifies a ProtocolDriver. A ProtocolDriver registered in the Protocol Driver manager under that name must exist. See Protocol Drivers Manager Configuration

`Username`: Passed from the SubPool to the EquipmentDriver on construction in the Map entry key `ConnectionResource.DefaultParameterNames.user`. If the SubPool to which the EquipmentDriver belongs is dynamic, the value of this parameter will be specified by the DynamicECPProperties `User` attribute (see DynamicECPProperties SubPool Properties). If the subpool is static, the value of this parameter will be specified by the `HPSA_EQUIPMENTCONNSUBPOOL USERNAME` DB field (see HPSA_EQUIPMENTCONNSUBPOOL DB Table).

`Password`: Passed from the SubPool to the EquipmentDriver on construction in the Map entry key `ConnectionResource.DefaultParameterNames.password`. If the SubPool to which the EquipmentDriver belongs is dynamic, the value of this parameter will be specified by the DynamicECPProperties `Password` attribute (see DynamicECPProperties SubPool Properties). If the subpool

is static, the value of this parameter will be specified by the HPSA_EQUIPMENTCONNSUBPOOL PASSWORD DB field (see HPSA_EQUIPMENTCONNSUBPOOL DB Table).

Passwordenable: Passed from the SubPool to the EquipmentDriver on construction in the Map entry key ConnectionResource.DefaultParameterNames.passwordEnable. If the SubPool to which the EquipmentDriver belongs is dynamic, the value of this parameter will be specified by the DynamicECPProperties PasswordEnable attribute (see DynamicECPProperties SubPool Properties). If the subpool is static, the value of this parameter will be specified by the HPSA_EQUIPMENTCONNSUBPOOL PASSWORDENABLE DB field (see HPSA_EQUIPMENTCONNSUBPOOL DB Table).

6.7. EquipmenDriver Configuration

Logger: This logger is set by the ConnectionResource (see ConnectionResource Configuration) and it will determine the PrintWriter and the initial LogLevel. EquipmentDriver won't use it for logging (except to log some error messages). Instead, it will use PrintWriter.

PrintWriter: Will be determined by the Logger. If the Logger has a WritableFileAppender, it will be used as PrinterWriter. In other case, System.out will be used.

LogLevel: Will determine the level of the messages to PrintWriter to print. Initially, LogLevel will be the LogLevel of Logger but the client can change it when requesting a connection. In fact, CLICommands will set the EquipmentDriver LogLevel to its own LogLevel when executing an Operation (see CLICommands Configuration).

if LogLevel equals org.apache.log4j.Level.INFO the EquipmentDriver will write on this PrintWriter the data read and written through the ProtocolDriver.

If LogLevel equals org.apache.log4j.Level.DEBUG, only the data read during configureTerminal will be logged but accumulating it, that is, if five consecutive read operations are needed to find a searched string, the five reading operations, each one including the previous read data, will be logged.

If an error is found, the read data will always be written.

6.7.1. EquipmentDriver Initialization Parameters Configuration

See EquipmentDriver Initialization Parameters Configuration

6.7.2. ConnectionResource Configuration

Logger: Each ConnectionResource will use the logger of the SubPool it belongs to, to log its messages (see SubPool Instance Specific Logging Parameters Configuration). It will also determine the Logger of the EquipmentDriver (see EquipmenDriver Configuration).

6.8. Protocol Drivers Manager Configuration

The Protocol Drivers Manager can be configured through the `ProtocolDrivers.lst` file. See ProtocolDrivers.lst File.

Additionally, the Protocol Drivers Manager will use the current log4j `LoggerRepository` to look for the logger with the name "`DriverManager`". A `ConsoleAppender` to stdout will be added to this logger, and used to log the Protocol Driver registering process.

6.9. ProtocolDriver Configuration

`SpyFile`: The directory where the spy files will be generated may be configured from the `ecp.properties` file `LOG_DIR` property. The spy file will be

```
LOG_DIR + "spy" + ${pool.name} + "_" + ${subpool.name} + "_" +
${resource.id} + ".log"
```

See ecp.properties File.

6.10. CLICommands Configuration

`Logger:` Default `AbstractLoggeable Logger` (`ConsoleAppender` to `System.out`):

`LogLevel`: On `CLICommands` construction, the `Logger` log level will be established to `org.apache.log4j.Level.INFO` if `bInfo==true`, or to `org.apache.log4j.Level.WARN` if `bInfo==false`. Later, this logger level will be used to determine the EquipmentDriver `LogLevel`, setting it to the same log level (see EquipmenDriver Configuration).

`ECPRMIServiceRegistryHostName`: Hostname of the registry service where the ECP RMI Service object has been bound. This parameter may be configured via `setRMIHostName`.

`ECPRMIServiceRegistryPort`: Port of the registry service where the ECP RMI Service object has been bound. This parameter may be configured via `setRMIPort`

`ECPRMIServiceReferenceName`: Name to which the ECP RMI Service reference has been bound. This parameter may be configured via `setRMIServiceName`

6.11. Template Parser Configuration

TemplateParser logs to `System.out` but when constructing the TemplateParser, the generated CLICommands `LogLevel` can be set. The `bInfo` parameter will be passed to the CLICommands. See CLICommands Configuration.

6.12. JMS Monitoring Configuration

`Enabling`: To enable JMS Monitoring, the `ecp.properties` field `ECP.Msgs.Enable` must be set to true. No Monitoring message will be sent if this property is set to other value. See 4.3.2 ecp.properties File, property "`ECP.Msgs.Enable`" for further details.

`Administered Objects Naming Context`: All the properties included in ecp.properties will be set as environment of the InitialContext instance used to look for administered objects. By default, the ecp.properties will use the Active MQ Initial Context Factory, setting the property "`java.naming.factory.initial=org.apache.activemq.jndi.ActiveMQInitialContextFactory`". Check Active MQ documentation and javax.naming.InitialContext for the possible values. It is possible for example to create administered Destinations by tweaking these properties. See 4.3.2 ecp.properties File, property "`java.naming.factory.initial`" for further details.

`JMS Broker Connection/Start`: It is possible to determine the JMS Broker that the ECP will connect to, indicating its URI in the the `ecp.properties` field `JMSBrokerReference.broker.uri`. This URI will be used for to instantiate an ActiveMQConnectionFactory, to create connections to the broker. Active MQ supports a wide variety of URIs, including embedded brokers, broker configuration through URI, multiple transport protocols etc. Check Active MQ documentation for details. By default the JMS Broker URI is "`vm\:(broker\:(tcp\://localhost\:4001)?brokerName\=EmbeddedBroker&useJmx\=true&persistent\=false&populateJMSXUserID\=false&useShutdownHook\=false&deleteAllMessagesOnStartup\=false&enableStatistics\=false)?marshal\=false`". "`vm`" URIs will start an embedded broker. See 4.3.2 ecp.properties File, property "`JMSBrokerReference.broker.uri`" for further details.

JMS ECP Messages Destination: It is possible to determine the destination type and name where ECP monitoring messages will be sent. See 4.3.2 ecp.properties File, properties "`JMSMessageBroker.dest.type`" and "`JMSMessageBroker.dest.name`" for further details.