



The Leading Open Source Backup Solution

Bacula® Console and Operators Guide

Kern Sibbald

February 4, 2019

This manual documents Bacula version 9.4.2 (04 February 2019)

Copyright © 2000-2018, Kern Sibbald
Bacula® is a registered trademark of Kern Sibbald.

This Bacula documentation by Kern Sibbald with contributions from many others,
a complete list can be found in the License chapter. Creative Commons

Attribution-ShareAlike 4.0 International License
<http://creativecommons.org/licenses/by-sa/4.0/>







Contents

| | | |
|----------|---|-----------|
| 1 | Bacula Console | 1 |
| 1.1 | Console Configuration | 1 |
| 1.2 | Running the Console Program | 1 |
| 1.3 | Stopping the Console Program | 2 |
| 1.4 | Alphabetic List of Console Keywords | 2 |
| 1.5 | Alphabetic List of Console Commands | 4 |
| 1.6 | Special dot Commands | 15 |
| 1.7 | Special At (@) Commands | 16 |
| 1.8 | Running the Console from a Shell Script | 16 |
| 1.9 | Adding Volumes to a Pool | 17 |
| 2 | Baculum API and Web GUI Tools | 19 |
| 2.1 | Base Features | 19 |
| 2.2 | General Requirements | 19 |
| 2.3 | Installation Baculum API from rpm binary packages | 20 |
| 2.3.1 | Add the Baculum rpm repository | 20 |
| 2.3.2 | Installation for the Apache | 21 |
| 2.3.3 | Installation for Lighttpd | 21 |
| 2.3.4 | Access to bconsole via sudo for Apache and Lighttpd | 21 |
| 2.4 | Installation Baculum API from deb binary packages | 21 |
| 2.4.1 | Add the Baculum deb repository | 22 |
| 2.4.2 | Installation for Apache | 22 |
| 2.4.3 | Installation for Lighttpd | 22 |
| 2.4.4 | Access to bconsole via sudo for Apache and Lighttpd | 23 |
| 2.5 | Debugging your First Baculum API Login | 23 |
| 2.6 | Installation Baculum Web from rpm binary packages | 23 |
| 2.6.1 | Installation for the Apache | 23 |
| 2.6.2 | Installation for Lighttpd | 23 |
| 2.7 | Installation Baculum Web from deb binary packages | 24 |
| 2.7.1 | Installation for Apache | 24 |
| 2.7.2 | Installation for Lighttpd | 24 |
| 2.8 | Running Baculum API and Web for the First Time | 24 |
| 2.8.1 | Running Baculum API | 24 |
| 2.8.2 | Running Baculum Web | 24 |
| 2.9 | Installation wizards | 24 |
| 2.10 | Baculum API endpoints | 28 |
| 2.10.1 | Clients | 28 |
| 2.10.2 | Storages | 28 |
| 2.10.3 | Volumes | 28 |
| 2.10.4 | Pools | 29 |
| 2.10.5 | Jobs | 29 |
| 2.10.6 | Bvfs | 32 |
| 2.10.7 | Config | 34 |
| 2.11 | Installation from the Source Tar File | 35 |
| 2.12 | OAuth2 authorization | 36 |
| 2.12.1 | Before running OAuth2 | 36 |
| 2.13 | Screenshots | 37 |



| | | |
|----------|--|-----------|
| 3 | Bacula Copyright, Trademark, and Licenses | 43 |
| 3.1 | CC-BY-SA | 43 |
| 3.2 | GPL | 43 |
| 3.3 | LGPL | 43 |
| 3.4 | Public Domain | 43 |
| 3.5 | Trademark | 43 |
| 3.6 | Fiduciary License Agreement | 43 |
| 3.7 | Disclaimer | 44 |
| 3.8 | Authors | 44 |



Chapter 1

Bacula Console

The **Bacula Console** (sometimes called the User Agent) is a program that allows the user or the System Administrator, to interact with the Bacula Director daemon while the daemon is running.

The current Bacula Console comes in two versions: a shell interface (TTY style), and a QT GUI interface (Bat). Both permit the administrator or authorized users to interact with Bacula. You can determine the status of a particular job, examine the contents of the Catalog as well as perform certain tape manipulations with the Console program.

Since the Console program interacts with the Director through the network, your Console and Director programs do not necessarily need to run on the same machine.

In fact, a certain minimal knowledge of the Console program is needed in order for Bacula to be able to write on more than one tape, because when Bacula requests a new tape, it waits until the user, via the Console program, indicates that the new tape is mounted.

1.1 Console Configuration

When the Console starts, it reads a standard Bacula configuration file named **bconsole.conf** or **bat.conf** in the case of the Bat QT Console version from the current directory unless you specify the **-c** command line option (see below). This file allows default configuration of the Console, and at the current time, the only Resource Record defined is the Director resource, which gives the Console the name and address of the Director. For more information on configuration of the Console program, please see the **Console Configuration** chapter (chapter 23 on page 247) of the Bacula Community Main Manual.

1.2 Running the Console Program

The console program can be run with the following options:

```
Usage: bconsole [-s] [-c config_file] [-d debug_level]
  -c <file>      set configuration file to file
  -dnn          set debug level to nn
  -n            no conio
  -s            no signals
  -u <nn>       set command execution timeout to <nn> seconds
  -t            test - read configuration and exit
  -?            print this message.
```

After launching the Console program (bconsole), it will prompt you for the next command with an asterisk (*). Generally, for all commands, you can simply enter the command name and the Console program will prompt you for the necessary arguments. Alternatively, in most cases, you may enter the command followed by arguments. The general format is:

```
<command> <keyword1>[=<argument1>] <keyword2>[=<argument2>] ...
```

where **command** is one of the commands listed below; **keyword** is one of the keywords listed below (usually followed by an argument); and **argument** is the value. The command may be abbreviated to the shortest unique form. If two commands have the same starting letters, the one that will be selected is the one that appears first in the **help** listing. If you want the second command, simply spell out the full command. None of the keywords following the command may be abbreviated.

For example:



```
list files jobid=23
```

will list all files saved for JobId 23. Or:

```
show pools
```

will display all the Pool resource records.

The maximum command line length is limited to 511 characters, so if you are scripting the console, you may need to take some care to limit the line length.

1.3 Stopping the Console Program

Normally, you simply enter **quit** or **exit** and the Console program will terminate. However, it waits until the Director acknowledges the command. If the Director is already doing a lengthy command (e.g. `prune`), it may take some time. If you want to immediately terminate the Console program, enter the **.quit** command. There is currently no way to interrupt a Console command once issued (i.e. Ctrl-C does not work). However, if you are at a prompt that is asking you to select one of several possibilities and you would like to abort the command, you can enter a period (`.`), and in most cases, you will either be returned to the main command prompt or if appropriate the previous prompt (in the case of nested prompts). In a few places such as where it is asking for a Volume name, the period will be taken to be the Volume name. In that case, you will most likely be able to cancel at the next prompt.

1.4 Alphabetic List of Console Keywords

Unless otherwise specified, each of the following keywords takes an argument, which is specified after the keyword following an equal sign. For example:

```
jobid=536
```

Please note, this list is incomplete as it is currently in the process of being created and is not currently totally in alphabetic order ...

all Permitted on the status and show commands to specify all components or resources respectively.

allfrompool Permitted on the update command to specify that all Volumes in the pool (specified on the command line) should be updated.

allfrompools Permitted on the update command to specify that all Volumes in all pools should be updated.

before Used in the restore command.

bootstrap Used in the restore command.

catalog Allowed in the use command to specify the catalog name to be used.

catalogs Used in the show command. Takes no arguments.

client — **fd**

clients Used in the show, list, and llist commands. Takes no arguments.

counters Used in the show command. Takes no arguments.

current Used in the restore command. Takes no argument.

days Used to define the number of days the "list nextvol" command should consider when looking for jobs to be run. The days keyword can also be used on the "status dir" command so that it will display jobs scheduled for the number of days you want.

devices Used in the show command. Takes no arguments.

dir — **director**

directors Used in the show command. Takes no arguments.

directory Used in the restore command. Its argument specifies the directory to be restored.



enabled This keyword can appear on the **update volume** as well as the **update slots** commands, and can allow one of the following arguments: yes, true, no, false, archived, 0, 1, 2. Where 0 corresponds to no or false, 1 corresponds to yes or true, and 2 corresponds to archived. Archived volumes will not be used, nor will the Media record in the catalog be pruned. Volumes that are not enabled, will not be used for backup or restore.

done Used in the restore command. Takes no argument.

file Used in the restore command.

files Used in the list and llist commands. Takes no arguments.

fileset

filesets Used in the show command. Takes no arguments.

help Used in the show command. Takes no arguments.

jobs Used in the show, list and llist commands. Takes no arguments.

jobmedia Used in the list and llist commands. Takes no arguments.

jobtotals Used in the list and llist commands. Takes no arguments.

jobid The JobId is the numeric jobid that is printed in the Job Report output. It is the index of the database record for the given job. While it is unique for all the existing Job records in the catalog database, the same JobId can be reused once a Job is removed from the catalog. Probably you will refer specific Jobs that ran using their numeric JobId.

job — **jobname** The Job or Jobname keyword refers to the name you specified in the Job resource, and hence it refers to any number of Jobs that ran. It is typically useful if you want to list all jobs of a particular name.

level

listing Permitted on the estimate command. Takes no argument.

limit

messages Used in the show command. Takes no arguments.

media Used in the list and llist commands. Takes no arguments.

nextvol — **nextvolume** Used in the list and llist commands. Takes no arguments.

on Takes no keyword.

off Takes no keyword.

pool

pools Used in the show, list, and llist commands. Takes no arguments.

select Used in the restore command. Takes no argument.

limit Used in the setbandwidth command. Takes integer in KB/s unit.

storages Used in the show command. Takes no arguments.

schedules Used in the show command. Takes no arguments.

sd — **store** — **storage**

ujobid The ujobid is a unique job identification that is printed in the Job Report output. At the current time, it consists of the Job name (from the Name directive for the job) appended with the date and time the job was run. This keyword is useful if you want to completely identify the Job instance run.

volume

volumes Used in the list and llist commands. Takes no arguments.

where Used in the restore command.

yes Used in the restore command. Takes no argument.



1.5 Alphabetic List of Console Commands

The following commands are currently implemented:

add [**pool**=<pool-name> **storage**=<storage> **jobid**=<JobId>] This command is used to add Volumes to an existing Pool. That is, it creates the Volume name in the catalog and inserts into the Pool in the catalog, but does not attempt to access the physical Volume. Once added, Bacula expects that Volume to exist and to be labeled. This command is not normally used since Bacula will automatically do the equivalent when Volumes are labeled. However, there may be times when you have removed a Volume from the catalog and want to later add it back.

Normally, the **label** command is used rather than this command because the **label** command labels the physical media (tape, disk, DVD, ...) and does the equivalent of the **add** command. The **add** command affects only the Catalog and not the physical media (data on Volumes). The physical media must exist and be labeled before use (usually with the **label** command). This command can, however, be useful if you wish to add a number of Volumes to the Pool that will be physically labeled at a later time. It can also be useful if you are importing a tape from another site. Please see the **label** command below for the list of legal characters in a Volume name.

autodisplay on/off This command accepts **on** or **off** as an argument, and turns auto-display of messages on or off respectively. The default for the console program is **off**, which means that you will be notified when there are console messages pending, but they will not automatically be displayed.

When autodisplay is turned off, you must explicitly retrieve the messages with the **messages** command. When autodisplay is turned on, the messages will be displayed on the console as they are received.

automount on/off This command accepts **on** or **off** as the argument, and turns auto-mounting of the Volume after a **label** command on or off respectively. The default is **on**. If **automount** is turned off, you must explicitly **mount** tape Volumes after a label command to use it.

cancel [**jobid**=<number> **job**=<job-name> **ujobid**=<unique-jobid>] This command is used to cancel a job and accepts **jobid=nnn** or **job=xxx** as an argument where nnn is replaced by the JobId and xxx is replaced by the job name. If you do not specify a keyword, the Console program will prompt you with the names of all the active jobs allowing you to choose one.

Once a Job is marked to be canceled, it may take a bit of time (generally within a minute but up to two hours) before the Job actually terminates, depending on what operations it is doing. Don't be surprised that you receive a Job not found message. That just means that one of the three daemons had already canceled the job. Messages numbered in the 1000's are from the Director, 2000's are from the File daemon and 3000's from the Storage daemon.

create [**pool**=<pool-name>] This command is not normally used as the Pool records are automatically created by the Director when it starts based on what it finds in the conf file. If needed, this command can be to create a Pool record in the database using the Pool resource record defined in the Director's configuration file. So in a sense, this command simply transfers the information from the Pool resource in the configuration file into the Catalog. Normally this command is done automatically for you when the Director starts providing the Pool is referenced within a Job resource. If you use this command on an existing Pool, it will automatically update the Catalog to have the same information as the Pool resource. After creating a Pool, you will most likely use the **label** command to label one or more volumes and add their names to the Media database.

When starting a Job, if Bacula determines that there is no Pool record in the database, but there is a Pool resource of the appropriate name, it will create it for you. If you want the Pool record to appear in the database immediately, simply use this command to force it to be created.

delete [**volume**=<vol-name> **pool**=<pool-name> **job** **jobid**=<id>] The delete command is used to delete a Volume, Pool or Job record from the Catalog as well as all associated catalog Volume records that were created. This command operates only on the Catalog database and has no effect on the actual data written to a Volume. This command can be dangerous and we strongly recommend that you do not use it unless you know what you are doing.

If the keyword **Volume** appears on the command line, the named Volume will be deleted from the catalog, if the keyword **Pool** appears on the command line, a Pool will be deleted, and if the keyword **Job** appears on the command line, a Job and all its associated records (File and JobMedia) will be deleted from the catalog. The full form of this command is:



```
delete pool=<pool-name>
```

or

```
delete volume=<volume-name> pool=<pool-name> or
```

```
delete JobId=<job-id> JobId=<job-id2> ... or
```

```
delete Job JobId=n,m,o-r,t ...
```

The first form deletes a Pool record from the catalog database. The second form deletes a Volume record from the specified pool in the catalog database. The third form deletes the specified Job record from the catalog database. The last form deletes JobId records for JobIds n, m, o, p, q, r, and t. Where each one of the n,m,... is, of course, a number. That is a "delete jobid" accepts lists and ranges of jobids.

disable job<job-name> This command permits you to disable a Job for automatic scheduling. The job may have been previously enabled with the Job resource **Enabled** directive or using the console **enable** command. The next time the Director is restarted, the Enable/Disable state will be set to the value in the Job resource (default enabled) as defined in the bacula-dir.conf file.

enable job<job-name> This command permits you to enable a Job for automatic scheduling. The job may have been previously disabled with the Job resource **Enabled** directive or using the console **disable** command. The next time the Director is restarted, the Enable/Disable state will be set to the value in the Job resource (default enabled) as defined in the bacula-dir.conf file.

estimate Using this command, you can get an idea how many files will be backed up, or if you are unsure about your Include statements in your FileSet, you can test them without doing an actual backup. The default is to assume a Full backup. However, you can override this by specifying a **level=Incremental** or **level=Differential** on the command line. A Job name must be specified or you will be prompted for one, and optionally a Client and FileSet may be specified on the command line. It then contacts the client which computes the number of files and bytes that would be backed up. Please note that this is an estimate calculated from the number of blocks in the file rather than by reading the actual bytes. As such, the estimated backup size will generally be larger than an actual backup.

The **estimate** command can use the accurate code to detect changes and give a better estimation. You can set the accurate behavior on command line using **accurate=yes/no** or use the Job setting as default value.

Optionally you may specify the keyword **listing** in which case, all the files to be backed up will be listed. Note, it could take quite some time to display them if the backup is large. The full form is:

```
estimate job=<job-name> listing client=<client-name> accurate=<yes/no>
      fileset=<fileset-name> level=<level-name>
```

Specification of the **job** is sufficient, but you can also override the client, fileset, accurate and/or level by specifying them on the estimate command line.

As an example, you might do:

```
@output /tmp/listing
estimate job=NightlySave listing level=Incremental
@output
```

which will do a full listing of all files to be backed up for the Job **NightlySave** during an Incremental save and put it in the file **/tmp/listing**. Note, the byte estimate provided by this command is based on the file size contained in the directory item. This can give wildly incorrect estimates of the actual storage used if there are sparse files on your systems. Sparse files are often found on 64 bit systems for certain system files. The size that is returned is the size Bacula will backup if the sparse option is not specified in the FileSet. There is currently no way to get an estimate of the real file size that would be found should the sparse option be enabled.

exit This command terminates the console program.



gui Invoke the non-interactive gui mode.

```
gui [on|off]
```

help This command displays the list of commands available.

label This command is used to label physical volumes. The full form of this command is:

```
label storage=<storage-name> volume=<volume-name>
      slot=<slot>
```

If you leave out any part, you will be prompted for it. The media type is automatically taken from the Storage resource definition that you supply. Once the necessary information is obtained, the Console program contacts the specified Storage daemon and requests that the Volume be labeled. If the Volume labeling is successful, the Console program will create a Volume record in the appropriate Pool.

The Volume name is restricted to letters, numbers, and the special characters hyphen (-), underscore (_), colon (:), and period (.). All other characters including a space are invalid. This restriction is to ensure good readability of Volume names to reduce operator errors.

Please note, when labeling a blank tape, Bacula will get **read I/O error** when it attempts to ensure that the tape is not already labeled. If you wish to avoid getting these messages, please write an EOF mark on your tape before attempting to label it:

```
mt rewind
mt weof
```

The label command can fail for a number of reasons:

1. The Volume name you specify is already in the Volume database.
2. The Storage daemon has a tape or other Volume already mounted on the device, in which case you must **unmount** the device, insert a blank tape, then do the **label** command.
3. The Volume in the device is already a Bacula labeled Volume. (Bacula will never relabel a Bacula labeled Volume unless it is recycled and you use the **relabel** command).
4. There is no Volume in the drive.

There are two ways to relabel a volume that already has a Bacula label. The brute force method is to write an end of file mark on the tape using the system **mt** program, something like the following:

```
mt -f /dev/st0 rewind
mt -f /dev/st0 weof
```

For a disk volume, you would manually delete the Volume.

Then you use the **label** command to add a new label. However, this could leave traces of the old volume in the catalog.

The preferable method to relabel a Volume is to first **purge** the volume, either automatically, or explicitly with the **purge** command, then use the **relabel** command described below.

If your autochanger has barcode labels, you can label all the Volumes in your autochanger one after another by using the **label barcodes** command. For each tape in the changer containing a barcode, Bacula will mount the tape and then label it with the same name as the barcode. An appropriate Media record will also be created in the catalog. Any barcode that begins with the same characters as specified on the "CleaningPrefix=xxx" directive in the Director's Pool resource, will be treated as a cleaning tape, and will not be labeled. However, an entry for the cleaning tape will be created in the catalog. For example with:

```
Pool {
    Name ...
    Cleaning Prefix = "CLN"
}
```



Any slot containing a barcode of CLNxxxx will be treated as a cleaning tape and will not be mounted. Note, the full form of the command is:

```
label storage=xxx pool=yyy slots=1-5,10 barcodes
```

list The list command lists the requested contents of the Catalog. The various fields of each record are listed on a single line. The various forms of the list command are:

```
list jobs

list jobid=<id>           (list jobid id)

list ujobid=<unique job name> (list job with unique name)

list job=<job-name>      (list all jobs with "job-name")

list jobname=<job-name>  (same as above)

    In the above, you can add "limit=nn" to limit the output to
    nn jobs.

list joblog jobid=<id> (list job output if recorded in the catalog)

list jobmedia

list jobmedia jobid=<id>

list jobmedia job=<job-name>

list files jobid=<id>

list files job=<job-name>

list pools

list clients

list jobtotals

list volumes

list volumes jobid=<id>

list volumes pool=<pool-name>

list volumes job=<job-name>

list volume=<volume-name>

list nextvolume job=<job-name>

list nextvol job=<job-name>

list nextvol job=<job-name> days=nnn
```

What most of the above commands do should be more or less obvious. In general if you do not specify all the command line arguments, the command will prompt you for what is needed.

The **list nextvol** command will print the Volume name to be used by the specified job. You should be aware that exactly what Volume will be used depends on a lot of factors including the time and what a prior job will do. It may fill a tape that is not full when you issue this command. As a consequence, this command will give you a good estimate of what Volume will be used but not a definitive answer. In addition, this command may have certain side effect because it runs through the same algorithm as a job, which means it may automatically purge or recycle a Volume. By default, the job specified must run within the next two days or no volume will be found. You can, however, use the **days=nnn** specification to specify up to 50 days. For example, if on Friday, you want to see what Volume will be needed on Monday, for job MyJob, you would use **list nextvol job=MyJob days=3**.

If you wish to add specialized commands that list the contents of the catalog, you can do so by adding them to the **query.sql** file. However, this takes some knowledge of programming SQL. Please see the



query command below for additional information. See below for listing the full contents of a catalog record with the **llist** command.

As an example, the command **list pools** might produce the following output:

| PoId | Name | NumVols | MaxVols | PoolType | LabelFormat |
|------|---------|---------|---------|----------|-------------|
| 1 | Default | 0 | 0 | Backup | * |
| 2 | Recycle | 0 | 8 | Backup | File |

As mentioned above, the **list** command lists what is in the database. Some things are put into the database immediately when Bacula starts up, but in general, most things are put in only when they are first used, which is the case for a Client as with Job records, etc.

Bacula should create a client record in the database the first time you run a job for that client. Doing a **status** will not cause a database record to be created. The client database record will be created whether or not the job fails, but it must at least start. When the Client is actually contacted, additional info from the client will be added to the client record (a "uname -a" output).

If you want to see what Client resources you have available in your conf file, you use the Console command **show clients**.

llist The llist or "long list" command takes all the same arguments that the list command described above does. The difference is that the llist command list the full contents of each database record selected. It does so by listing the various fields of the record vertically, with one field per line. It is possible to produce a very large number of output lines with this command.

If instead of the **list pools** as in the example above, you enter **llist pools** you might get the following output:

```
PoolId: 1
Name: Default
NumVols: 0
MaxVols: 0
UseOnce: 0
UseCatalog: 1
AcceptAnyVolume: 1
VolRetention: 1,296,000
VolUseDuration: 86,400
MaxVolJobs: 0
MaxVolBytes: 0
AutoPrune: 0
Recycle: 1
PoolType: Backup
LabelFormat: *

PoolId: 2
Name: Recycle
NumVols: 0
MaxVols: 8
UseOnce: 0
UseCatalog: 1
AcceptAnyVolume: 1
VolRetention: 3,600
VolUseDuration: 3,600
MaxVolJobs: 1
MaxVolBytes: 0
AutoPrune: 0
Recycle: 1
PoolType: Backup
LabelFormat: File
```

messages This command causes any pending console messages to be immediately displayed.

memory Print current memory usage.

mount The mount command is used to get Bacula to read a volume on a physical device. It is a way to tell Bacula that you have mounted a tape and that Bacula should examine the tape. This command



is normally used only after there was no Volume in a drive and Bacula requests you to mount a new Volume or when you have specifically unmounted a Volume with the **unmount** console command, which causes Bacula to close the drive. If you have an autoloader, the mount command will not cause Bacula to operate the autoloader unless you specify a **slot** and possibly a **drive**. The various forms of the mount command are:

```
mount storage=<storage-name> [ slot=<num> ] [ drive=<num> ]
mount [ jobid=<id> — job=<job-name> ]
```

If you have specified **Automatic Mount = yes** in the Storage daemon's Device resource, under most circumstances, Bacula will automatically access the Volume unless you have explicitly **unmounted** it in the Console program.

prune The Prune command allows you to safely remove expired database records from Jobs, Volumes and Statistics. This command works only on the Catalog database and does not affect data written to Volumes. In all cases, the Prune command applies a retention period to the specified records. You can Prune expired File entries from Job records; you can Prune expired Job records from the database, and you can Prune both expired Job and File records from specified Volumes.

```
prune files—jobs—volume—stats client=<client-name> volume=<volume-name>
```

For a Volume to be pruned, the **VolStatus** must be Full, Used, or Append, otherwise the pruning will not take place.

purge The Purge command will delete associated Catalog database records from Jobs and Volumes without considering the retention period. **Purge** works only on the Catalog database and does not affect data written to Volumes. This command can be dangerous because you can delete catalog records associated with current backups of files, and we recommend that you do not use it unless you know what you are doing. The permitted forms of **purge** are:

```
purge files jobid=<jobid>—job=<job-name>—client=<client-name>
purge jobs client=<client-name> (of all jobs)
purge volume—volume=<vol-name> (of all jobs)
```

For the **purge** command to work on Volume Catalog database records the **VolStatus** must be Append, Full, Used, or Error.

The actual data written to the Volume will be unaffected by this command unless you are using the **ActionOnPurge=Truncate** option on those Media.

To ask Bacula to truncate your **Purged** volumes, you need to use the following command in interactive mode or in a RunScript:

```
*purge volume action=truncate storage=File allpools
# or by default, action=all
*purge volume action storage=File pool=Default
```

This is possible to specify the volume name, the media type, the pool, the storage, etc... (see **help purge**) Be sure that your storage device is idle when you decide to run this command.

query This command reads a predefined SQL query from the query file (the name and location of the query file is defined with the QueryFile resource record in the Director's configuration file). You are prompted to select a query from the file, and possibly enter one or more parameters, then the command is submitted to the Catalog database SQL engine.

The following queries are currently available (version 2.2.7):

Available queries:

- 1: List up to 20 places where a File is saved regardless of the directory
- 2: List where the most recent copies of a file are saved
- 3: List last 20 Full Backups for a Client
- 4: List all backups for a Client after a specified time
- 5: List all backups for a Client
- 6: List Volume Attributes for a selected Volume
- 7: List Volumes used by selected JobId
- 8: List Volumes to Restore All Files
- 9: List Pool Attributes for a selected Pool
- 10: List total files/bytes by Job
- 11: List total files/bytes by Volume



```
12: List Files for a selected JobId
13: List Jobs stored on a selected MediaId
14: List Jobs stored for a given Volume name
15: List Volumes Bacula thinks are in changer
16: List Volumes likely to need replacement from age or errors
Choose a query (1-16):
```

quit This command terminates the console program. The console program sends the **quit** request to the Director and waits for acknowledgment. If the Director is busy doing a previous command for you that has not terminated, it may take some time. You may quit immediately by issuing the **.quit** command (i.e. quit preceded by a period).

relabel This command is used to label physical volumes. The full form of this command is:

```
relabel storage=<storage-name> oldvolume=<old-volume-name> volume=<newvolume-name>
```

If you leave out any part, you will be prompted for it. In order for the Volume (old-volume-name) to be relabeled, it must be in the catalog, and the volume status must be marked **Purged** or **Recycle**. This happens automatically as a result of applying retention periods, or you may explicitly purge the volume using the **purge** command.

Once the volume is physically relabeled, the old data previously written on the Volume is lost and cannot be recovered.

release This command is used to cause the Storage daemon to rewind (release) the current tape in the drive, and to re-read the Volume label the next time the tape is used.

```
release storage=<storage-name>
```

After a release command, the device is still kept open by Bacula (unless Always Open is set to No in the Storage Daemon's configuration) so it cannot be used by another program. However, with some tape drives, the operator can remove the current tape and to insert a different one, and when the next Job starts, Bacula will know to re-read the tape label to find out what tape is mounted. If you want to be able to use the drive with another program (e.g. **mt**), you must use the **unmount** command to cause Bacula to completely release (close) the device.

reload The reload command causes the Director to re-read its configuration file and apply the new values. The new values will take effect immediately for all new jobs. However, if you change schedules, be aware that the scheduler pre-schedules jobs up to two hours in advance, so any changes that are to take place during the next two hours may be delayed. Jobs that have already been scheduled to run (i.e. surpassed their requested start time) will continue with the old values. New jobs will use the new values. Each time you issue a reload command while jobs are running, the old config values will be kept until all jobs that were running before issuing the reload terminate, at which time the old config values will be released from memory. As a default a maximum number of 32 reload requests that can be made, which is generally sufficient. In the case that you make a very large number of reload requests, you may use the **Maximum Reload Requests** directive in the Director resource of **bacula-dir.conf** to set a larger maximum to that value you wish.

restore The restore command allows you to select one or more Jobs (JobIds) to be restored using various methods. Once the JobIds are selected, the File records for those Jobs are placed in an internal Bacula directory tree, and the restore enters a file selection mode that allows you to interactively walk up and down the file tree selecting individual files to be restored. This mode is somewhat similar to the standard Unix **restore** program's interactive file selection mode.

```
restore storage=<storage-name> client=<backup-client-name> where=<path> pool=<pool-name>
fileset=<fileset-name> restoreclient=<restore-client-name> restorejob=<job-name> select current all
done
```

Where **current**, if specified, tells the restore command to automatically select a restore to the most current backup. If not specified, you will be prompted. The **all** specification tells the restore command to restore all files. If it is not specified, you will be prompted for the files to restore. For details of the **restore** command, please see the **Restore** chapter (chapter 25 on page 255) of the Bacula Community Main Manual.

The client keyword initially specifies the client from which the backup was made and the client to which the restore will be made. However, if the restoreclient keyword is specified, then the restore is written to that client.



The restore job rarely needs to be specified, as bacula installations commonly only have a single restore job configured. However, for certain cases, such as a varying list of RunScript specifications, multiple restore jobs may be configured. The `restorejob` argument allows the selection of one of these jobs.

run This command allows you to schedule jobs to be run immediately. The full form of the command is:

```
run job=<job-name> client=<client-name> fileset=<FileSet-name> level=<level-keyword>
storage=<storage-name> where=<directory-prefix> when=<universal-time-specification> spool-
data=yes—no yes
```

Any information that is needed but not specified will be listed for selection, and before starting the job, you will be prompted to accept, reject, or modify the parameters of the job to be run, unless you have specified **yes**, in which case the job will be immediately sent to the scheduler.

On my system, when I enter a run command, I get the following prompt:

```
A job name must be specified.
The defined Job resources are:
  1: Matou
  2: Polymatou
  3: Rufus
  4: Minimatou
  5: Minou
  6: PmatouVerify
  7: MatouVerify
  8: RufusVerify
  9: Watchdog
Select Job resource (1-9):
```

If I then select number 5, I am prompted with:

```
Run Backup job
JobName: Minou
FileSet: Minou Full Set
Level: Incremental
Client: Minou
Storage: DLTDDrive
Pool: Default
When: 2003-04-23 17:08:18
OK to run? (yes/mod/no):
```

If I now enter **yes**, the Job will be run. If I enter **mod**, I will be presented with the following prompt.

```
Parameters to modify:
  1: Level
  2: Storage
  3: Job
  4: FileSet
  5: Client
  6: When
  7: Pool
Select parameter to modify (1-7):
```

If you wish to start a job at a later time, you can do so by setting the **When** time. Use the **mod** option and select **When** (no. 6). Then enter the desired start time in YYYY-MM-DD HH:MM:SS format.

The `spooldata` argument of the `run` command cannot be modified through the menu and is only accessible by setting its value on the initial command line. If no `spooldata` flag is set, the job, storage or schedule flag is used.

setbandwidth This command is used to limit the bandwidth of a running job or a client.

```
setbandwidth limit=|nb| [ jobid=|id| — client=|cli| ]
```

setdebug This command is used to set the debug level in each daemon. The form of this command is:

```
setdebug level=nn [trace=0/1 client=<client-name> — dir — director — storage=<storage-name>
— all]
```




If `trace=1` is set, then tracing will be enabled, and the daemon will be placed in trace mode, which means that all debug output as set by the debug level will be directed to the file **bacula.trace** in the current directory of the daemon. Normally, tracing is needed only for Win32 clients where the debug output cannot be written to a terminal or redirected to a file. When tracing, each debug output message is appended to the trace file. You must explicitly delete the file when you are done.

setip Sets new client address – if authorized.

A console is authorized to use the **SetIP** command only if it has a Console resource definition in both the Director and the Console. In addition, if the console name, provided on the **Name =** directive, must be the same as a Client name, the user of that console is permitted to use the **SetIP** command to change the Address directive in the Director's client resource to the IP address of the Console. This permits portables or other machines using DHCP (non-fixed IP addresses) to "notify" the Director of their current IP address.

show The show command will list the Director's resource records as defined in the Director's configuration file (normally **bacula-dir.conf**). This command is used mainly for debugging purposes by developers. The following keywords are accepted on the show command line: catalogs, clients, counters, devices, directors, filesets, jobs, messages, pools, schedules, storages, all, help. Please don't confuse this command with the **list**, which displays the contents of the catalog.

sqlquery The sqlquery command puts the Console program into SQL query mode where each line you enter is concatenated to the previous line until a semicolon (;) is seen. The semicolon terminates the command, which is then passed directly to the SQL database engine. When the output from the SQL engine is displayed, the formation of a new SQL command begins. To terminate SQL query mode and return to the Console command prompt, you enter a period (.) in column 1.

Using this command, you can query the SQL catalog database directly. Note you should really know what you are doing otherwise you could damage the catalog database. See the **query** command below for simpler and safer way of entering SQL queries.

Depending on what database engine you are using (MySQL, PostgreSQL or SQLite), you will have somewhat different SQL commands available. For more detailed information, please refer to the MySQL, PostgreSQL or SQLite documentation.

status This command will display the status of all components. For the director, it will display the next jobs that are scheduled during the next 24 hours as well as the status of currently running jobs. For the Storage Daemon, you will have drive status or autochanger content. The File Daemon will give you information about current jobs like average speed or file accounting. The full form of this command is:

```
status [all — dir=<dir-name> — director [days=nnn] — client=<client-name> — [slots]
storage=<storage-name>]
```

If you do a **status dir**, the console will list any currently running jobs, a summary of all jobs scheduled to be run in the next 24 hours, and a listing of the last ten terminated jobs with their statuses. The scheduled jobs summary will include the Volume name to be used. You should be aware of two things: 1. to obtain the volume name, the code goes through the same code that will be used when the job runs, but it does not do pruning nor recycling of Volumes; 2. The Volume listed is at best a guess. The Volume actually used may be different because of the time difference (more durations may expire when the job runs) and another job could completely fill the Volume requiring a new one.

In the Running Jobs listing, you may find the following types of information:

```
2507 Catalog MatouVerify.2004-03-13_05.05.02 is waiting execution
5349 Full CatalogBackup.2004-03-13_01.10.00 is waiting for higher
      priority jobs to finish
5348 Differe Minou.2004-03-13_01.05.09 is waiting on max Storage jobs
5343 Full Rufus.2004-03-13_01.05.04 is running
```

Looking at the above listing from bottom to top, obviously JobId 5343 (Rufus) is running. JobId 5348 (Minou) is waiting for JobId 5343 to finish because it is using the Storage resource, hence the "waiting on max Storage jobs". JobId 5349 has a lower priority than all the other jobs so it is waiting for higher priority jobs to finish, and finally, JobId 2507 (MatouVerify) is waiting because only one job can run at a time, hence it is simply "waiting execution"

If you do a **status dir**, it will by default list the first occurrence of all jobs that are scheduled today and tomorrow. If you wish to see the jobs that are scheduled in the next three days (e.g. on Friday



you want to see the first occurrence of what tapes are scheduled to be used on Friday, the weekend, and Monday), you can add the **days=3** option. Note, a **days=0** shows the first occurrence of jobs scheduled today only. If you have multiple run statements, the first occurrence of each run statement for the job will be displayed for the period specified.

If your job seems to be blocked, you can get a general idea of the problem by doing a **status dir**, but you can most often get a much more specific indication of the problem by doing a **status storage=xxx**. For example, on an idle test system, when we do **status storage=File**, we get:

```
status storage=File
Connecting to Storage daemon File at 192.168.68.112:8103

rufus-sd Version: 1.39.6 (24 March 2006) i686-pc-linux-gnu redhat (Stentz)
Daemon started 26-Mar-06 11:06, 0 Jobs run since started.

Running Jobs:
No Jobs running.
=====

Jobs waiting to reserve a drive:
=====

Terminated Jobs:
  JobId  Level   Files          Bytes Status   Finished      Name
=====
    59   Full     234      4,417,599 OK      15-Jan-06 11:54 kernsave
=====

Device status:
Autochanger "DDS-4-changer" with devices:
  "DDS-4" (/dev/nst0)
Device "DDS-4" (/dev/nst0) is mounted with Volume="TestVolume002"
Pool="*unknown*"
  Slot 2 is loaded in drive 0.
  Total Bytes Read=0 Blocks Read=0 Bytes/block=0
  Positioned at File=0 Block=0

Device "DVD-Writer" (/dev/hdc) is not open.
Device "File" (/tmp) is not open.
=====

In Use Volume status:
=====
```

Now, what this tells us is that no jobs are running and that none of the devices are in use. Now, if we **unmount** the autochanger, which will not be used in this example, and then start a Job that uses the File device, the job will block. When we re-issue the status storage command, we get for the Device status:

```
status storage=File
...
Device status:
Autochanger "DDS-4-changer" with devices:
  "DDS-4" (/dev/nst0)
Device "DDS-4" (/dev/nst0) is not open.
  Device is BLOCKED. User unmounted.
  Drive 0 is not loaded.

Device "DVD-Writer" (/dev/hdc) is not open.
Device "File" (/tmp) is not open.
  Device is BLOCKED waiting for media.
=====
...
```

Now, here it should be clear that if a job were running that wanted to use the Autochanger (with two devices), it would block because the user unmounted the device. The real problem for the Job I started using the "File" device is that the device is blocked waiting for media – that is Bacula needs you to label a Volume.

If you enter **status storage**, Bacula will prompt you with a list of the storage resources. When you select one, the Storage daemon will be requested to do a **status**. However, note that the Storage



daemon will do a status of all the devices it has, and not just of the one you requested. In the current version of Bacula, when you enter the **status storage** command, it prompts you only with a subset of all the storage resources that the Director considers to be in different Storage daemons. In other words, it attempts to remove duplicate storage definitions. This can be a bit confusing at first, but can vastly simplify the prompt listing if you have defined a large number of storage resources.

If you prefer to see the full list of all storage resources, simply add the keyword **select** to the command such as: **status select storage** and you will get a prompt that includes all storage resources even if they reference the same storage daemon.

time Prints the current time.

trace Turn on/off trace to file.

umount For old-time Unix guys. See the unmount command for full details.

unmount This command causes the indicated Bacula Storage daemon to unmount the specified device. The forms of the command are the same as the mount command:

```
unmount storage=<storage-name> [ drive=<num> ]

unmount [ jobid=<id> | job=<job-name> ]
```

Once you unmount a storage device, Bacula will no longer be able to use it until you issue a mount command for that device. If Bacula needs to access that device, it will block and issue mount requests periodically to the operator.

If the device you are unmounting is an autochanger, it will unload the drive you have specified on the command line. If no drive is specified, it will assume drive 1.

update This command will update the catalog for either a specific Pool record, a Volume record, or the Slots in an autochanger with barcode capability. In the case of updating a Pool record, the new information will be automatically taken from the corresponding Director's configuration resource record. It can be used to increase the maximum number of volumes permitted or to set a maximum number of volumes. The following main keywords may be specified:

```
media, volume, pool, slots, stats
```

In the case of updating a Volume, you will be prompted for which value you wish to change. The following Volume parameters may be changed:

```
Volume Status
Volume Retention Period
Volume Use Duration
Maximum Volume Jobs
Maximum Volume Files
Maximum Volume Bytes
Recycle Flag
Recycle Pool
Slot
InChanger Flag
Pool
Volume Files
Volume from Pool
All Volumes from Pool
All Volumes from all Pools
```

For slots **update slots**, Bacula will obtain a list of slots and their barcodes from the Storage daemon, and for each barcode found, it will automatically update the slot in the catalog Media record to correspond to the new value. This is very useful if you have moved cassettes in the magazine, or if you have removed the magazine and inserted a different one. As the slot of each Volume is updated, the InChanger flag for that Volume will also be set, and any other Volumes in the Pool that were last mounted on the same Storage device will have their InChanger flag turned off. This permits Bacula to know what magazine (tape holder) is currently in the autochanger.

If you do not have barcodes, you can accomplish the same thing in version 1.33 and later by using the **update slots scan** command. The **scan** keyword tells Bacula to physically mount each tape and to read its VolumeName.



For Pool **update pool**, Bacula will move the Volume record from its existing pool to the pool specified.

For **Volume from Pool**, **All Volumes from Pool** and **All Volumes from all Pools**, the following values are updated from the Pool record: Recycle, RecyclePool, VolRetention, VolUseDuration, MaxVolJobs, MaxVolFiles, and MaxVolBytes. (RecyclePool feature is available with bacula 2.1.4 or higher.)

The full form of the update command with all command line arguments is:

```
update volume=xxx pool=yyy slots volstatus=xxx VolRetention=ddd
    VolUse=ddd MaxVolJobs=nnn MaxVolBytes=nnn Recycle=yes|no
    slot=nnn enabled=n recyclepool=zzz
```

use This command allows you to specify which Catalog database to use. Normally, you will be using only one database so this will be done automatically. In the case that you are using more than one database, you can use this command to switch from one to another.

```
use [catalog=name-of-catalog]
```

var This command takes a string or quoted string and does variable expansion on it the same way variable expansion is done on the **LabelFormat** string. Thus, for the most part, you can test your LabelFormat strings. The difference between the **var** command and the actual LabelFormat process is that during the var command, no job is running so "dummy" values are used in place of Job specific variables. Generally, however, you will get a good idea of what is going to happen in the real case.

version The command prints the Director's version.

wait The wait command causes the Director to pause until there are no jobs running. This command is useful in a batch situation such as regression testing where you wish to start a job and wait until that job completes before continuing. This command now has the following options:

```
wait [jobid=nn] [jobuid=unique id] [job=job name]
```

If specified with a specific JobId, ... the wait command will wait for that particular job to terminate before continuing.

1.6 Special dot Commands

There is a list of commands that are prefixed with a period (.). These commands are intended to be used either by batch programs or graphical user interface front-ends. They are not normally used by interactive users. Once GUI development begins, this list will be considerably expanded. The following is the list of dot commands:

| | |
|---|--|
| .backups job=xxx | list backups for specified job |
| .clients | list all client names |
| .defaults client=xxx fileset=yyy | list defaults for specified client |
| .die | cause the Director to segment fault (for debugging) |
| .dir | when in tree mode prints the equivalent to the dir command, but with fields separated by commas rather than spaces. |
| .exit | quit |
| .filesets | list all fileset names |
| .help | help command output |
| .jobs | list all job names |
| .levels | list all levels |
| .messages | get quick messages |
| .msgs | return any queued messages |
| .pools | list all pool names |
| .quit | quit |
| .status | get status output |
| .storage | return storage resource names |
| .types | list job types |



1.7 Special At (@) Commands

Normally, all commands entered to the Console program are immediately forwarded to the Director, which may be on another machine, to be executed. However, there is a small list of **at** commands, all beginning with an at character (@), that will not be sent to the Director, but rather interpreted by the Console program directly. Note, these commands are implemented only in the tty console program and not in the Bat Console. These commands are:

@input <filename> Read and execute the commands contained in the file specified.

@output <filename> w/a Send all following output to the filename specified either overwriting the file (w) or appending to the file (a). To redirect the output to the terminal, simply enter **@output** without a filename specification. WARNING: be careful not to overwrite a valid file. A typical example during a regression test might be:

```
@output /dev/null
commands ...
@output
```

@tee <filename> w/a Send all subsequent output to both the specified file and the terminal. It is turned off by specifying **@tee** or **@output** without a filename.

@sleep <seconds> Sleep the specified number of seconds.

@time Print the current time and date.

@version Print the console's version.

@quit quit

@exit quit

@# anything Comment

@help Get the list of every special @ commands.

@separator <char> When using bconsole with readline, you can set the command separator to one of those characters to write commands who require multiple input on one line, or to put multiple commands on a single line.

```
!$%&'()*+,-/;:<>?[ ]^`{|}~
```

Note, if you use a semicolon (;) as a separator character, which is common, you will not be able to use the **sql** command, which requires each command to be terminated by a semicolon.

1.8 Running the Console from a Shell Script

You can automate many Console tasks by running the console program from a shell script. For example, if you have created a file containing the following commands:

```
./bconsole -c ./bconsole.conf <<END_OF_DATA
unmount storage=DDS-4
quit
END_OF_DATA
```

when that file is executed, it will unmount the current DDS-4 storage device. You might want to run this command during a Job by using the **RunBeforeJob** or **RunAfterJob** records.

It is also possible to run the Console program from file input where the file contains the commands as follows:

```
./bconsole -c ./bconsole.conf <filename
```

where the file named **filename** contains any set of console commands.

As a real example, the following script is part of the Bacula regression tests. It labels a volume (a disk volume), runs a backup, then does a restore of the files saved.

```
bin/bconsole -c bin/bconsole.conf <<END_OF_DATA
@output /dev/null
messages
@output /tmp/log1.out
label volume=TestVolume001
run job=Client1 yes
wait
messages
@#
@# now do a restore
@#
@output /tmp/log2.out
restore current all
yes
wait
messages
@output
quit
END_OF_DATA
```

The output from the backup is directed to /tmp/log1.out and the output from the restore is directed to /tmp/log2.out. To ensure that the backup and restore ran correctly, the output files are checked with:

```
grep "^ *Termination: *Backup OK" /tmp/log1.out
backupstat=$?
grep "^ *Termination: *Restore OK" /tmp/log2.out
restorestat=$?
```

1.9 Adding Volumes to a Pool

If you have used the **label** command to label a Volume, it will be automatically added to the Pool, and you will not need to add any media to the pool.

Alternatively, you may choose to add a number of Volumes to the pool without labeling them. At a later time when the Volume is requested by **Bacula** you will need to label it.

Before adding a volume, you must know the following information:

1. The name of the Pool (normally "Default")
2. The Media Type as specified in the Storage Resource in the Director's configuration file (e.g. "DLT8000")
3. The number and names of the Volumes you wish to create.

For example, to add media to a Pool, you would issue the following commands to the console program:

```
*add
Enter name of Pool to add Volumes to: Default
Enter the Media Type: DLT8000
Enter number of Media volumes to create. Max=1000: 10
Enter base volume name: Save
Enter the starting number: 1
10 Volumes created in pool Default
*
```

To see what you have added, enter:

```
*list media pool=Default
+-----+-----+-----+-----+-----+-----+
| MedId | VolumeNa | MediaTyp | VolStat | Bytes | LastWritten |
+-----+-----+-----+-----+-----+-----+
| 11 | Save0001 | DLT8000 | Append | 0 | 0000-00-00 00:00 |
| 12 | Save0002 | DLT8000 | Append | 0 | 0000-00-00 00:00 |
| 13 | Save0003 | DLT8000 | Append | 0 | 0000-00-00 00:00 |
| 14 | Save0004 | DLT8000 | Append | 0 | 0000-00-00 00:00 |
| 15 | Save0005 | DLT8000 | Append | 0 | 0000-00-00 00:00 |
| 16 | Save0006 | DLT8000 | Append | 0 | 0000-00-00 00:00 |
| 17 | Save0007 | DLT8000 | Append | 0 | 0000-00-00 00:00 |
| 18 | Save0008 | DLT8000 | Append | 0 | 0000-00-00 00:00 |
| 19 | Save0009 | DLT8000 | Append | 0 | 0000-00-00 00:00 |
| 20 | Save0010 | DLT8000 | Append | 0 | 0000-00-00 00:00 |
+-----+-----+-----+-----+-----+-----+
*
```



Notice that the console program automatically appended a number to the base Volume name that you specify (Save in this case). If you don't want it to append a number, you can simply answer 0 (zero) to the question "Enter number of Media volumes to create. Max=1000:", and in this case, it will create a single Volume with the exact name you specify.



Chapter 2

Baculum API and Web GUI Tools

This chapter presents the Bacula Web based interface that has been added to the Bacula project for version 7.0 and later.

2.1 Base Features

Baculum provides the following base features:

- Running Bacula jobs (backup, restore, verify...).
- Baculum API with OAuth2 authorization and HTTP Basic authentication.
- Baculum Web GUI - modern mobile-friendly web interface.
- Configuring Bacula on local and remote hosts.
- Monitoring Bacula service status.
- Bacula console available via a Web window.
- Multi-user interface.
- Support for customized and restricted consoles (Console ACL function).
- Volume management.
- User friendly graphs and metrics.
- Basic storage daemon operations (mount, umount, release, ...).
- Easy to use configuration and restore wizards.
- Multiple Director support.
- Live AJAX based statuses.

2.2 General Requirements

Environment for Baculum Web installation should have following components installed:

- A Web Server - with mod_rewrite module loaded. Baculum Web has been tested with Apache and Lighttpd web servers.
- PHP 5.3.4 or higher with following modules installed:
 - cURL PHP module.
 - MB String PHP module.
 - JSON PHP module.

Environment for Baculum API installation should have following components installed:



- A Web Server - with mod_rewrite module loaded. Baculum has been tested with Apache and Lighttpd web servers.
- PHP 5.3.4 or higher with following modules installed:
 - PDO PHP support - depending on your catalog database: PDO PostgreSQL or PDO MySQL. Note, in case using MySQL database there is required to use MySQL native driver. It is php-mysqlnd for PHP, not php-mysql.
 - BCMath PHP module.
 - JSON PHP module.
- A working Bacula bconsole - configured Bacula text based console
- Direct access to the Bacula Catalog database (local or remote)

With installation from binary packages (deb, rpm) all requirements will be automatically installed as packages dependencies.

2.3 Installation Baculum API from rpm binary packages

Note Before start using Baculum API and Baculum Web version 9.0.0 please backup your Bacula configuration in safe place. It is specially important because on first save config action the Bacula configuration is joined into one file per Bacula component.

For rpm binary there are the following packages:

- baculum-api - main Baculum API package with application files
- baculum-api-httpd - Apache web server configuration files for Baculum API
- baculum-api-lighttpd - Lighttpd web server configuration files for Baculum API
- baculum-common - Common files for Baculum API and Baculum Web
- baculum-web - main Baculum Web package with application files
- baculum-web-httpd - Apache web server configuration files for Baculum Web
- baculum-web-lighttpd - Lighttpd web server configuration files for Baculum Web

2.3.1 Add the Baculum rpm repository

To add the Baculum repository, first you must import the Baculum public key:

```
rpm --import http://bacula.org/downloads/baculum/baculum.pub
```

Once the key is imported, the next step is to add the repository definition. First you must create the following file:

```
/etc/yum.repos.d/baculum.repo
```

The for CentOS 7, put the following in the file just created:

```
[baculumrepo]
name=Baculum CentOS repository
baseurl=http://bacula.org/downloads/baculum/stable/centos
gpgcheck=1
enabled=1
```

For Fedora 29 the **bacula.repo** file should have the following contents:

```
[baculumrepo]
name=Baculum Fedora repository
baseurl=http://bacula.org/downloads/baculum/stable/fedora
gpgcheck=1
enabled=1
```




2.3.2 Installation for the Apache

Install the Baculum API for the Apache Web server as follows:

```
yum install baculum-common baculum-api baculum-api-httpd
```

Restart your Apache Web server:

```
service httpd restart
```

2.3.3 Installation for Lighttpd

Installation on system with access via Lighttpd is as follows

```
yum install baculum-common baculum-api baculum-api-lighttpd
```

Please note that in case CentOS distribution the Lighttpd web server is available in the distribution packages after enabling the EPEL repository.

Start Baculum as application using the Lighttpd Web server:

```
service baculum-api-lighttpd start
```

2.3.4 Access to bconsole via sudo for Apache and Lighttpd

Baculum API requires access to Bconsole and to Bacula JSON programs. To configure Bconsole sudo access and the Bacula JSON programs access there can use following entries in newly created Baculum sudoers.d file (usually in path /etc/sudoers.d/baculum):

In case default Apache user, the file contents must be:

```
Defaults:apache !requiretty
apache ALL=NOPASSWD: /usr/sbin/bconsole
apache ALL=NOPASSWD: /usr/sbin/bdirjson
apache ALL=NOPASSWD: /usr/sbin/bsdjson
apache ALL=NOPASSWD: /usr/sbin/bfdjson
apache ALL=NOPASSWD: /usr/sbin/bbconsjson
```

In case default Lighttpd user the file contents must be:

```
Defaults:lighttpd !requiretty
lighttpd ALL=NOPASSWD: /usr/sbin/bconsole
lighttpd ALL=NOPASSWD: /usr/sbin/bdirjson
lighttpd ALL=NOPASSWD: /usr/sbin/bsdjson
lighttpd ALL=NOPASSWD: /usr/sbin/bfdjson
lighttpd ALL=NOPASSWD: /usr/sbin/bbconsjson
```

2.4 Installation Baculum API from deb binary packages

Note Before start using Baculum API and Baculum Web version 9.0.0 please backup your Bacula configuration in safe place. It is specially important because on first save config action the Bacula configuration is joined into one file per Bacula component.

For deb binary there are the following packages:

- baculum-api - main Baculum API package with application files
- baculum-api-apache2 - Apache web server configuration files for Baculum API
- baculum-api-lighttpd - Lighttpd web server configuration files for Baculum API
- baculum-common - Common files for Baculum API and Baculum Web
- baculum-web - main Baculum Web package with application files
- baculum-web-apache2 - Apache web server configuration files for Baculum Web
- baculum-web-lighttpd - Lighttpd web server configuration files for Baculum Web



2.4.1 Add the Baculum deb repository

To add the Baculum repository, first import the Baculum public key:

```
wget -q0 - http://bacula.org/downloads/baculum/baculum.pub | apt-key add -
```

Once the key is imported, the next step is to create a new baculum file:

```
/etc/apt/sources.list.d/baculum.list
```

For Debian 8 Jessie the contents should be:

```
deb http://bacula.org/downloads/baculum/stable/debian jessie main
deb-src http://bacula.org/downloads/baculum/stable/debian jessie main
```

For Debian 9 Stretch the contents should be:

```
deb http://bacula.org/downloads/baculum/stable/debian stretch main
deb-src http://bacula.org/downloads/baculum/stable/debian stretch main
```

For Ubuntu 16.04 Xenial the contents should be:

```
deb [ arch=amd64 ] http://bacula.org/downloads/baculum/stable/ubuntu xenial main
deb-src http://bacula.org/downloads/baculum/stable/ubuntu xenial main
```

For Ubuntu 18.04 Bionic the contents should be:

```
deb [ arch=amd64 ] http://bacula.org/downloads/baculum/stable/ubuntu bionic main
deb-src http://bacula.org/downloads/baculum/stable/ubuntu bionic main
```

After adding repository definition, please refresh repository indexes:

```
apt-get update
```

2.4.2 Installation for Apache

To install Baculum API access via Apache Web server by using apt packages manager use the command:

```
apt-get install baculum-common baculum-api baculum-api-apache2
```

Next you must enable mod_rewrite module for Apache, with the following command:

```
a2enmod rewrite
```

and include Baculum VirtualHost definition in the Apache configuration with:

```
a2ensite baculum-api
```

The restart your Apache server with:

```
service apache2 restart
```

2.4.3 Installation for Lighttpd

Example installation with access via Lighttpd web server looks following:

```
apt-get install baculum-common baculum-api baculum-api-lighttpd
```

Start Baculum API as application available through Lighttpd web server:

```
service baculum-api-lighttpd start
```



2.4.4 Access to bconsole via sudo for Apache and Lighttpd

Baculum API requires access to Bconsole and to the Bacula JSON programs. To configure Bconsole sudo access we strongly recommend that you create a Baculum sudoers.d file, which should be in `/etc/sudoers.d/baculum`:

Note, please define sudo for the Bacula JSON programs only when you are going use Bacula configuration module in the Baculum.

Both for Apache and Lighttpd user the file contents can be:

```
Defaults:www-data !requiretty
www-data  ALL=NOPASSWD:  /usr/sbin/bconsole
www-data  ALL=NOPASSWD:  /usr/sbin/bdirjson
www-data  ALL=NOPASSWD:  /usr/sbin/bsdjson
www-data  ALL=NOPASSWD:  /usr/sbin/bfdjson
www-data  ALL=NOPASSWD:  /usr/sbin/bbconsjson
```

2.5 Debugging your First Baculum API Login

At each step of the initial login to Baculum, the screen will have a test button that will allow you to check to see if your parameters were correctly entered. If not, you will see error message on the wizard page. You can also get additional detail by examining the Apache error log, that is usually found at:

```
/var/log/httpd/baculum-api-error.log
```

If you use Lighttpd then to get additional detail you can check:

```
/var/log/lighttpd/baculum-api-error.log
```

In addition, special debug output is placed by Baculum in the file:

```
/usr/share/baculum/htdocs/protected/API/Logs/baculum-api.log
```

The debug you can enable in file:

```
/usr/share/baculum/htdocs/protected/API/Config/api.conf
```

by switching in `[api]` section option `debug` to `"1"`.

With the information in those two files, you can usually quickly find and correct most problems.

2.6 Installation Baculum Web from rpm binary packages

2.6.1 Installation for the Apache

Install the Baculum Web for the Apache Web server as follows:

```
yum install baculum-common baculum-web baculum-web-httpd
```

Restart your Apache Web server:

```
service httpd restart
```

2.6.2 Installation for Lighttpd

Installation on system with access via Lighttpd is as follows

```
yum install baculum-common baculum-web baculum-web-lighttpd
```

Please note that in case CentOS distribution the Lighttpd web server is available in the distribution packages after enabling the EPEL repository.

Start Baculum as application using the Lighttpd Web server:

```
service baculum-web-lighttpd start
```



2.7 Installation Baculum Web from deb binary packages

2.7.1 Installation for Apache

To install Baculum Web access via Apache Web server by using apt packages manager use the command:

```
apt-get install baculum-common baculum-web baculum-web-apache2
```

Next you must enable mod_rewrite module for Apache, with the following command:

```
a2enmod rewrite
```

and include Baculum VirtualHost definition in the Apache configuration with:

```
a2ensite baculum-web
```

The restart your Apache server with:

```
service apache2 restart
```

2.7.2 Installation for Lighttpd

Example installation with access via Lighttpd web server looks following:

```
apt-get install baculum-common baculum-web baculum-web-lighttpd
```

Start Baculum Web as application available through Lighttpd web server:

```
service baculum-web-lighttpd start
```

2.8 Running Baculum API and Web for the First Time

2.8.1 Running Baculum API

Access to Baculum API from web browser: **http://localhost:9096**

First time login: **admin**

First time password: **admin**

2.8.2 Running Baculum Web

Access to Baculum Web from web browser: **http://localhost:9095**

First time login: **admin**

First time password: **admin**

2.9 Installation wizards

Installation with HTTP Basic authentication



Bacula API

Language Catalog API Console API Config API Authorization Finish

Step 1 - select language

Language:

Next >

Language Catalog API Console API Config API Authorization Finish

Step 2 - share the Bacula Catalog Database

Do you want to setup and share the Bacula Catalog Database access for this API instance?

☐ No
☒ Yes

Database type:

Database name:

Login:

Password:

IP address (or hostname):

Port:

Connection test: ☒

Previous Next >

Language Catalog API Console API Config API Authorization Finish

Step 3 - share the Bacula Bconsole commands interface

Do you want to setup and share the Bacula Bconsole interface to execute commands in this API instance?

☐ No
☒ Yes

Bconsole binary file path:

Bconsole admin config file path:

Use sudo: ☒

Bconsole connection test: ☒

NOTE!
Bacula needs access to bconsole by the web server.

Previous Next >

Language Catalog API Console API Config API Authorization Finish

Step 4 - share the Bacula configuration interface

Do you want to setup and share the Bacula configuration interface to configure Bacula components via this API instance?

☐ No
☒ Yes

General configuration

Directory path for new config files: ☒

Use sudo: ☒

Director

Isdemon binary file path: ☒

Main Director config file path (usually bacula-dir.conf): ☒

Storage Daemon

Isdemon binary file path: ☒

Main Storage Daemon config file path (usually bacula-sd.conf): ☒

File Daemon/Client

Isdemon binary file path: ☒

Main File Daemon config file path (usually bacula-ft.conf): ☒

Bconsole

Isdemon binary file path: ☒

Admin Bconsole config file path (usually bconsole.conf): ☒

Test configuration

Previous Next >

Language Catalog API Console API Config API Authorization Finish

Step 5 - authorization to API

☒ Use OAuth2 for authorization and authentication
☐ Use HTTP Basic authentication

Administration login:

Administration password:

Retype administration password:

Bacula Web

Language Add APIs Authentication Finish

Step 1 - select language

Language:

Next >

Language Add APIs Authentication Finish

Step 2 - add API instances

Bacula web interface requires to add at least one Baculum API instance with shared Catalog access. Please add API instance.

Add API host

Protocol:

IP Address/hostname:

Port:

Use OAuth2 for authentication and authentication
Use HTTP Basic authentication



Installation with OAuth2 authorization



Bacula API

Language Catalog API Console API Config API Authorization Finish

Step 1 - select language

Language:

Language Catalog API Console API Config API Authorization Finish

Step 2 - share the Bacula Catalog Database

Do you want to setup and to share the Bacula Catalog Database access for this API instance?

☐ No
☒ Yes

Database type:

Database name:

Login:

Password:

IP address (or hostname):

Port:

Connection test:

Language Catalog API Console API Config API Authorization Finish

Step 3 - share the Bacula Bconsole commands interface

Do you want to setup and share the Bacula Bconsole interface to execute commands in this API instance?

☐ No
☒ Yes

Bconsole binary file path:

Bconsole admin config file path:

Use sudo: ☒

Bconsole connection test:

NOTE!
Baculum needs access to bconsole by the web server.

Language Catalog API Console API Config API Authorization Finish

Step 4 - share the Bacula configuration interface

Do you want to setup and share the Bacula configuration interface to configure Bacula components via this API instance?

☐ No
☒ Yes

General configuration

Directory path for new config files:

Use sudo: ☒

Director

bdircron binary file path:

Main Director config file path (usually bacula-dir.conf):

Storage Daemon

bdircron binary file path:

Main Storage Daemon config file path (usually bacula-sd.conf):

File Daemon/Client

bdircron binary file path:

Main File Daemon config file path (usually bacula-fd.conf):

Bconsole

bdircron binary file path:

Admin Bconsole config file path (usually bconsole.conf):

Language Catalog API Console API Config API Authorization Finish

Step 5 - authorization to API

☒ Use OAuth2 for authorization and authentication
☐ Use HTTP Basic authentication

First client registration

Please do not forget to disable HTTP Basic auth in the API web server config. Otherwise OAuth2 will not work.

OAuth2 Client ID:

OAuth2 Client Secret:

OAuth2 Redirect URI (example: https://baculum.org/909/webredirect):

OAuth2 scopes (space separated): (optional)

Dedicated Bconsole config file path:

Baculum Web

Language Add API Authentication Finish

Step 1 - select language

Language:

Language Add API Authentication Finish

Step 2 - add API instances

Baculum web interface requires to add at least one Baculum API instance with shared Catalog access. Please add API instance.

Add API host

Protocol:

IP Address/hostname:

Port:



2.10 Baculum API endpoints

2.10.1 Clients

GET /api/clients - get records all clients
GET /api/clients/limit/4 - get records first 4 clients
GET /api/clients/2 - get records only for client with clientid equal 2
GET /api/clients/show - get 'show clients' bconsole command
GET /api/clients/show/2 - get 'show client=xxx' bconsole command for client with clientid equal 2
GET /api/clients/status/2 - get 'status client=xxx' bconsole command for client with clientid equal 2
GET /api/clients/jobs/2 - get all jobs done by client with clientid equal 2

Errors:

0 - No errors.
1 - Invalid command.
2 - Problem with connection to database.
3 - Database access is not supported by this API instance.
4 - Problem with connection to bconsole.
5 - Invalid director.
6 - Problem with authorization to Baculum API.
7 - Access attempt to not allowed resource. Permission denied.
10 - Client with inputted clientid does not exists.
11 - Bconsole support is disabled.
1000 - Internal error.

2.10.2 Storages

GET /api/storages/ - get records all storages.
GET /api/storages/limit/25 - get records first 25 storages.
GET /api/storages/3 - get records only for storage with storageid equal 3.
GET /api/storages/show - get 'show storages' bconsole command.
GET /api/storages/show/3 - get 'show storage=xxx' bconsole command for storage with storageid equal 3.
GET /api/storages/status/3 - get 'status storage=xxx' bconsole command for storage with storageid equal 3.
GET /api/storages/mount/3/2/17 - mount storage with storageid equal 3, drive number 2 and volume in slot number 17.
GET /api/storages/umount/3/1 - umount storage with storageid equal 3 and drive number 1.
GET /api/storages/release/3 - release storage with storageid equal 3.

Errors:

0 - No errors.
1 - Invalid command.
2 - Problem with connection to database.
3 - Database access is not supported by this API instance.
4 - Problem with connection to bconsole.
5 - Invalid director.
6 - Problem with authorization to Baculum API.
7 - Access attempt to not allowed resource. Permission denied.
11 - Bconsole support is disabled.
20 - Storage with inputted storageid does not exists.
1000 - Internal error.

2.10.3 Volumes

GET /api/volumes/ - get records all volumes.
GET /api/volumes/limit/50 - get records first 50 volumes.
GET /api/volumes/5 - get records only for volume with mediaid equal 5.
GET /api/volumes/prune/5 - call prune action on volume with mediaid equal 5.
GET /api/volumes/purge/5 - call purge action on volume with mediaid equal 5.
GET /api/volumes/jobs/5 - get all jobs done on volume with mediaid equal 5.



GET /api/volumes/required/7/1234/ - get all volumes required to restore file with fileid equal 1234 and jobid equal 7.

Errors:

- 0 - No errors.
- 1 - Invalid command.
- 2 - Problem with connection to database.
- 3 - Database access is not supported by this API instance.
- 4 - Problem with connection to bconsole.
- 5 - Invalid director.
- 6 - Problem with authorization to Baculum API.
- 7 - Access attempt to not allowed resource. Permission denied.
- 11 - Bconsole support is disabled.
- 30 - Volume with inputted mediaid does not exists.
- 1000 - Internal error.

2.10.4 Pools

GET /api/pools/ - get records all pools.

GET /api/pools/limit/15 - get records first 15 pools.

GET /api/pools/7 - get records only for pool with poolid equal 7.

GET /api/pools/show - get 'show pools' bconsole command.

GET /api/pools/show/7 - get 'show pool=xxx' bconsole command for pool with poolid equal 7.

PUT /api/pools/update/7 - call 'update pool=xxx' bconsole command for pool with poolid equal 7.

Errors:

- 0 - No errors.
- 1 - Invalid command.
- 2 - Problem with connection to database.
- 3 - Database access is not supported by this API instance.
- 4 - Problem with connection to bconsole.
- 5 - Invalid director.
- 6 - Problem with authorization to Baculum API.
- 7 - Access attempt to not allowed resource. Permission denied.
- 11 - Bconsole support is disabled.
- 40 - Pool with inputted poolid does not exists.
- 1000 - internal error.

2.10.5 Jobs

GET /api/jobs/ - get records all jobs.

GET /api/jobs/limit/20 - get records first 20 jobs.

GET /api/jobs/8 - get records only for job with jobid equal 8.

GET /api/jobs/tasks/ - get job names for all directors

GET /api/jobs/tasks/type/B - get backup job names

GET /api/jobs/tasks/type/R/limit/5 - get first 5 restore job names

GET /api/jobs/recent/myjob/client/myclient-fd/filesetid/62/ - get most recent job identifiers for job "myjob", client "myclient-fd" and fileset with filesetid 62

GET /api/jobs/recent/myjob/clientid/31/filesetid/62/ - get most recent job identifiers for job "myjob", client with clientid 21 and fileset with filesetid 62

POST /jobs/estimate/ - call estimate action on a job.

| /api/jobs/estimate/ POST request | | | |
|----------------------------------|---------|---|--|
| Name | Type | Description | |
| create[id] * | integer | job id to get job name for estimate purpose | |
| | | (used instead job name) | |



| | | | |
|--------------------|---------|---|--|
| create[name] * | string | job name to estimate (used instead of jobid) | |
| | | | |
| create[fileset] * | string | FileSet resource name | |
| | | | |
| create[level] * | string | Job level in short form. One case sensitive letter: F => Full I => Incremental D => Differential B => Base f => VirtualFull V => InitCatalog C => Catalog O => VolumeToCatalog d => DiskToCatalog | |
| | | | |
| create[clientid] * | integer | Client identifier (used instead of client name) | |
| | | | |
| create[client] * | string | Client name (used instead of client id) | |
| | | | |
| create[accurate] * | integer | Enable accurate mode: 0 - no, 1 - yes | |
| | | | |

* - required field

POST /api/jobs/run/ - call run action on job (run job).

| /api/jobs/run/ POST request | | | |
|-----------------------------|---------|---|--|
| Name | Type | Description | |
| create[id] * | integer | job id to get job name to run (used instead job name) | |
| | | | |
| create[name] * | string | job name to run (used instead of jobid) | |
| | | | |
| create[level] * | string | Job level in short form. One case sensitive letter: F => Full I => Incremental D => Differential B => Base f => VirtualFull V => InitCatalog C => Catalog O => VolumeToCatalog d => DiskToCatalog | |
| | | | |
| create[fileset] * | string | FileSet resource name | |
| | | | |
| create[clientid] * | integer | Client identifier (used instead of client name) | |
| | | | |

2.10. BACULUM API ENDPOINTS

| | | | |
|---------------------|---------|---|---------|
| create[client] * | string | Client name (used instead of client id) | |
| | | | |
| +-----+ | +-----+ | +-----+ | +-----+ |
| create[storageid] * | integer | Storage identifier | |
| | | (used instead of storage name) | |
| +-----+ | +-----+ | +-----+ | +-----+ |
| create[storage] * | string | Storage name (used instead of storage id) | |
| | | | |
| +-----+ | +-----+ | +-----+ | +-----+ |
| create[poolid] * | integer | Pool identifier (used instead of pool name) | |
| | | | |
| +-----+ | +-----+ | +-----+ | +-----+ |
| create[pool] * | string | Pool name (used instead of pool id) | |
| | | | |
| +-----+ | +-----+ | +-----+ | +-----+ |
| create[priority] | integer | Job priority to run | |
| | | | |
| +-----+ | +-----+ | +-----+ | +-----+ |
| create[jobid] | integer | Job identifier for verify job | |
| | | | |
| +-----+ | +-----+ | +-----+ | +-----+ |
| create[verifyjob] | string | Verify job name | |
| | | | |
| +-----+ | +-----+ | +-----+ | +-----+ |

* - required field

POST /api/jobs/restore/ - call restore action.

| | | | |
|---|---------|---|---------|
| +-----+ /api/jobs/restore/ POST request +-----+ | | | |
| Name | Type | Description | |
| +-----+ | +-----+ | +-----+ | +-----+ |
| create[rpath] * | string | Bvfs temporary table name for restore purpose | |
| | | in form: b2[0-9]+ | |
| +-----+ | +-----+ | +-----+ | +-----+ |
| create[clientid] * | integer | Client identifier | |
| | | (used instead of client name) | |
| +-----+ | +-----+ | +-----+ | +-----+ |
| create[client] * | string | Client name (used instead of client id) | |
| | | | |
| +-----+ | +-----+ | +-----+ | +-----+ |
| create[priority] | integer | Job priority to run | |
| | | | |
| +-----+ | +-----+ | +-----+ | +-----+ |
| create[where] * | string | Destination directory for restored files | |
| | | | |
| +-----+ | +-----+ | +-----+ | +-----+ |
| create[replace] * | string | Replace files in destination directory for | |
| | | restored files. Available options: | |
| | | - never | |
| | | - ifolder | |
| | | - ifnewer | |
| | | - always | |
| +-----+ | +-----+ | +-----+ | +-----+ |
| create[restorejob] | string | Restore job name | |
| | | | |
| +-----+ | +-----+ | +-----+ | +-----+ |
| create[strip_prefix] | string | Strip prefix from restored paths /etc | |
| | | | |
| +-----+ | +-----+ | +-----+ | +-----+ |



| | | | |
|---------------------------|--------|---|--|
| +-----+-----+-----+-----+ | | | |
| create[add_prefix] | string | Add prefix to restored paths /tmp/myetc | |
| | | It can't be used with 'where' parameter | |
| +-----+-----+-----+-----+ | | | |
| create[add_suffix] | string | Add suffix to restored path e.g. .old | |
| | | | |
| +-----+-----+-----+-----+ | | | |
| create[regex_where] | string | Pattern matched for each restored path | |
| | | e.g. !a.pdf!a.bkp.pdf! | |
| +-----+-----+-----+-----+ | | | |

* - required field

DELETE /api/jobs/8 - delete by bconsole job with jobid equal 8.

Errors:

- 0 - No errors.
- 1 - Invalid command.
- 2 - Problem with connection to database.
- 3 - Database access is not supported by this API instance.
- 4 - Problem with connection to bconsole.
- 5 - Invalid director.
- 6 - Problem with authorization to Baculum API.
- 7 - Access attempt to not allowed resource. Permission denied.
- 11 - Bconsole support is disabled.
- 50 - Job with inputted jobid does not exist.
- 51 - Inputted job level is invalid.
- 52 - Fileset resource does not exist.
- 53 - Client does not exist.
- 54 - Storage does not exist.
- 55 - Pool does not exist.
- 56 - [restore only] inputted rpath for restore is invalid. Proper format is b2[0-9]+.
- 57 - [restore only] inputted "where" option is invalid.
- 58 - [restore only] inputted "replace" option is invalid.
- 1000 - internal error.

2.10.6 Bvfs

PUT /api/bvfs/lsdirs/ - listing from Bvfs cache directories

PUT /api/bvfs/lsdirs/limit/250 - listing from Bvfs cache directories limited to 250 elements.

PUT /api/bvfs/lsdirs/limit/250/100/ - listing from Bvfs cache directories limited to 250 elements with offset equal 100.

| | | | |
|-------------------------------|--------|--|--|
| +-----+-----+-----+-----+ | | | |
| /api/bvfs/lsdirs/ PUT request | | | |
| +-----+-----+-----+-----+ | | | |
| Name | Type | Description | |
| +-----+-----+-----+-----+ | | | |
| update[jobids] * | string | Job identifiers separated by comma character | |
| | | | |
| +-----+-----+-----+-----+ | | | |
| update[path] * | string | Path to list directories in Bvfs job cache | |
| | | | |
| +-----+-----+-----+-----+ | | | |

PUT /api/bvfs/lsfiles/ - listing from Bvfs cache files.

PUT /api/bvfs/lsfiles/limit/60/ - listing from Bvfs cache files limited to 60 elements.

PUT /api/bvfs/lsfiles/limit/120/60/ - listing from Bvfs cache files limited to 120 elements with offset equal 60



| /api/bvfs/lfiles/ PUT request | | |
|-------------------------------|--------|--|
| Name | Type | Description |
| update[jobids] * | string | Job identifiers separated by comma character |
| update[path] * | string | Path to list directories in Bvfs job cache |

GET /api/bvfs/versions/abc-fd/123/456/789/ - listing from Bvfs cache all files versions for client named abc-fd, for jobid equal 123, for pathid equal 456 and for filenameid equal 789. URL-encoded client name is necessary.

GET /api/bvfs/getjobids/9/ - listing from Bvfs cache all elementary jobids which are necessary for restore all files from job with jobid equal 9 (eg. if jobid 9 is job type incremental or differential).

PUT /api/bvfs/update/ - updating Bvfs cache for specific job.

| /api/bvfs/update/ PUT request | | |
|-------------------------------|--------|--|
| Name | Type | Description |
| update[jobids] * | string | Job identifiers separated by comma character |

POST /api/bvfs/restore/ - preparing Bvfs paths for restore command.

| /api/bvfs/restore/ POST request | | |
|---------------------------------|--------|--|
| Name | Type | Description |
| create[jobids] * | string | job identifiers comma separated |
| create[dirid] | string | directory identifiers comma separated |
| create[fileid] | string | file identifiers comma separated |
| create[findex] | string | comma separated pairs jobid and fileindex e.g. jobid1,findex1,jobid2,findex2 Used to restore hardlinks |
| create[path] * | string | temporary Bvfs table table name in form b2[0-9]+ |

* - required field

PUT /api/bvfs/clear/ - call '.bvfs_clear_cache yes' bconsole command.

Errors:

- 0 - No errors.
- 1 - Invalid command.
- 2 - Problem with connection to database.
- 3 - Database access is not supported by this API instance.



- 4 - Problem with connection to bconsole.
- 5 - Invalid director.
- 6 - Problem with authorization to Baculum API.
- 7 - Access attempt to not allowed resource. Permission denied.
- 11 - Bconsole support is disabled.
- 71 - Inputted path for restore is invalid. Proper format is b2[0-9]+.
- 72 - Inputted BVFS path param is invalid.
- 73 - Invalid jobid list.
- 74 - Invalid fileid list.
- 75 - Invalid file index list.
- 76 - Invalid dirid list.
- 77 - Invalid client name.
- 1000 - Internal error.

2.10.7 Config

To configure the Bacula resources is used request in the following URL form:

PUT /api/config/COMPONENT_TYPE/RESOURCE_TYPE/RESOURCE_NAME

- COMPONENT_TYPE: dir for Director, sd for Storage Daemon, fd for File Daemon and bcons for Consoles
- RESOURCE_TYPE: Job, Client, Pool, Messages, Schedule, Storage...etc.
- RESOURCE_NAME: Resource name from 'Name' resource directive like 'My Client 123', 'Device-01', 'Pool-Incremental-2' ...etc.

Example config URLs:

PUT /api/config/dir/Client/myclient-fd - editing client 'myclient-fd'. If the Client doesn't exist, it is created in config.

PUT /api/config/sd/Device/Drive-01 - editing device 'Drive-01'. If the Device doesn't exist, it is created in config.

| /api/config/component_type/resource_type/resource_name/ PUT request | | |
|---|---------------|---|
| Name | Type | Description |
| update[config] * | string (JSON) | Bacula config in JSON format. |
| | | In versions lower than 9.0.6 instead of JSON string there was used serialized associative PHP array |

* - required field

Errors:

- 0 - No errors.
- 6 - Problem with authorization to Baculum API.
- 7 - Access attempt to not allowed resource. Permission denied.
- 80 - JSON tools support is disabled.
- 81 - Problem with connection to a JSON tool.
- 82 - JSON tool returned wrong exitcode.
- 83 - JSON tool output was unable to parse.
- 84 - JSON tool not configured.
- 93 - Write to config file error.
- 94 - Config validation error.
- 1000 - Internal error.

Example cURL commands to test:



```
curl -X PUT -d update["config"]='{"AutoPrune":false,"Catalog":"MyCatalog",
"FdPort":9102,"MaximumConcurrentJobs":5,"Name":"easystar-fd","Address":
"172.16.10.12","Password":"mypass"}'
http://user:pass@apihost:9096/api/config/dir/Client/easystar-fd

curl -X PUT -d update["config"]='{"RemovableMedia":true,"RandomAccess":false,
"AutomaticMount":true,"AlwaysOpen":true,"OfflineOnUnmount":true,"DeviceType":
"Tape","Name":"TapeDrive","MediaType":"LT05","ArchiveDevice":"/dev/nst0",
"SpoolDirectory":"/mnt/backup","MaximumOpenWait":300}'
http://user:pass@apihost:9096/api/config/sd/Device/TapeDrive
```

2.11 Installation from the Source Tar File

You may also install Baculum from the source bacula-gui tar archive.

To prepare Baculum runtime files one uses the Makefile file. To do this, after unpacking bacula-gui archive please go to Baculum main directory:

```
cd ./web/baculum/
```

Then please run (depending on used distribution):

For rpm-based distributions (example with /tmp/baculum-runtime destination directory):

```
make build DESTDIR=/tmp/baculum-runtime
```

For deb-based distributions (example with /tmp/baculum-runtime destination directory):

```
make build DESTDIR=/tmp/baculum-release SAMPLETYPE=deb-template \
HTTPDNAME=apache2 HTTPDSITECONF=sites-available
```

After execution above command, in path /tmp/baculum-runtime should contain all required runtime files. The Base Baculum source files will be located in:

```
/tmp/baculum-runtime/usr/share/baculum/htdocs/
```

These are the files that should be placed in web server's document root (or Virtual Host document root) directory.

Please note that for language files (including English) symbolic links must be created as shown below:

```
/usr/share/locale/en/LC_MESSAGES/baculum.mo
=> /tmp/baculum-runtime/usr/share/baculum/htdocs/protected/Lang/en/baculum.mo
```

```
/usr/share/locale/pl/LC_MESSAGES/baculum.mo
=> /tmp/baculum-runtime/usr/share/baculum/htdocs/protected/Lang/pl/baculum.mo
```

```
/usr/share/locale/pt/LC_MESSAGES/baculum.mo
=> /tmp/baculum-runtime/usr/share/baculum/htdocs/protected/Lang/pt/baculum.mo
```

```
/usr/share/locale/ja/LC_MESSAGES/baculum.mo
=> /tmp/baculum-runtime/usr/share/baculum/htdocs/protected/Lang/ja/baculum.mo
```

Please also update the symbolic link to the Baculum settings directory in the following paths:

```
/tmp/baculum-runtime/usr/share/baculum/htdocs/protected/API/Config
/tmp/baculum-runtime/usr/share/baculum/htdocs/protected/Web/Config
```

Other files are: web servers configuration files, systemd units, SELinux policy module and others. Please select and copy appropriate files to your system environment and edit their content if needed.

You must set read/write privileges for the Web server user to the files and directories listed below:

```
./baculum/assets/
./baculum/protected/Web/Config
./baculum/protected/API/Config
./baculum/protected/Web/baculum.users
./baculum/protected/API/baculum.users
./baculum/protected/runtime/
```



2.12 OAuth2 authorization

Baculum API can use OAuth2 for authorization and authentication.

To obtain tokens there is used **Authorization Code Grant** flow. Authorization and access token URLs are as follows:

```
Authorization URL: /api/auth/
Access Token URL: /api/token/
```

Baculum API doesn't use refresh tokens. After expiration token the client application has to re-authorize again.

Default expiration time for authorization code is 7 seconds, for access token 60 seconds. These values are changed in:

```
/usr/share/baculum/htdocs/protected/Common/Class/OAuth2.php
```

in constants `AUTHORIZATION_ID_EXPIRES_TIME` and `ACCESS_TOKEN_EXPIRES_TIME`.

Default OAuth2 callback URL in Baculum Web is following:

```
https://baculumgui:9095/web/redirect
```

2.12.1 Before running OAuth2

Important note before using OAuth2

When you decide to use OAuth2, you must change default HTTP Basic authorization setting. Otherwise OAuth2 will not work. It is for enabling OAuth2 acces for `/api/` endpoints but still keep HTTP Basic protection for the Baculum API panel pages.

For Apache the change is about switching in Baculum API Apache config the Location tag from `/` to `/api/page`.

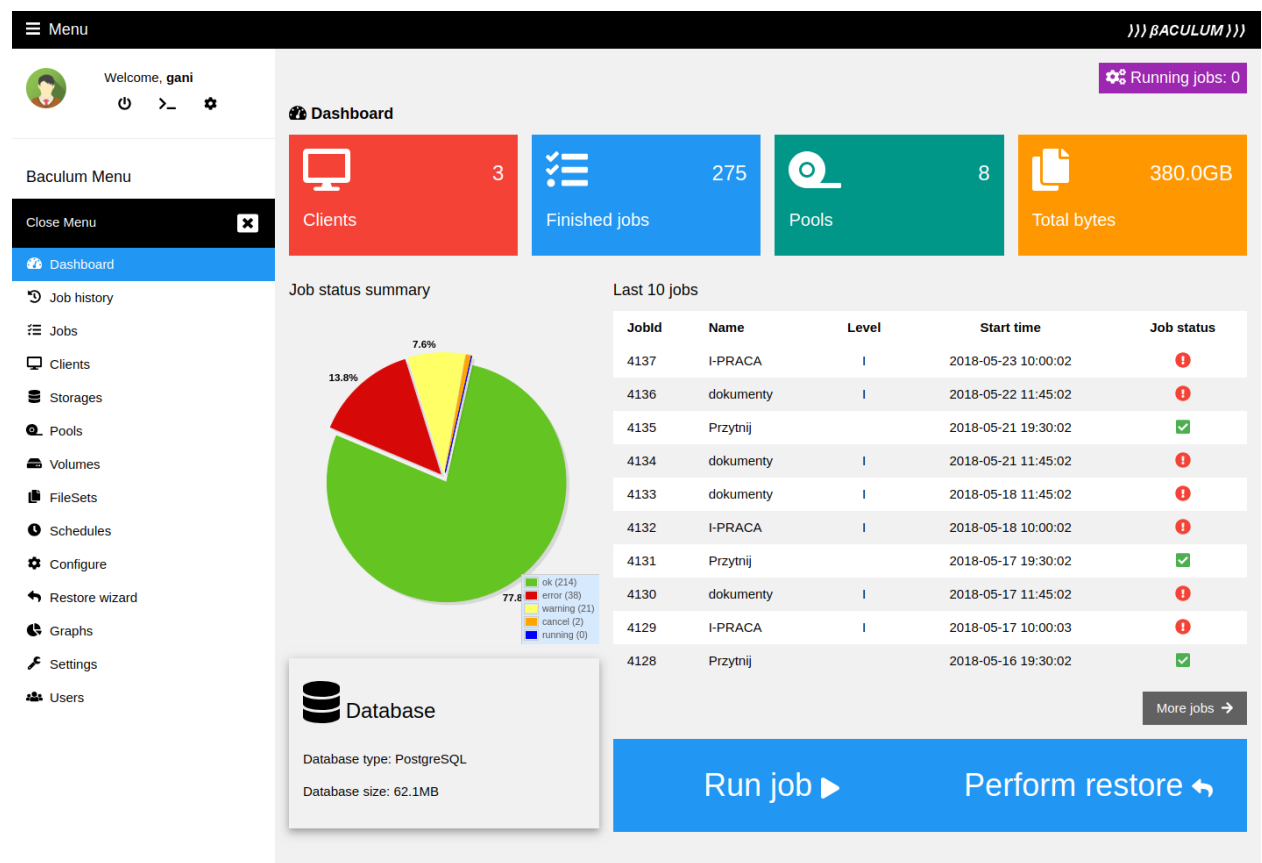
```
# NOTE: When you use OAuth2 then change this location section
# From: <Location />
# To:   <Location /api/page>
#
<Location />
    AuthType Basic
    AuthName "Baculum Auth"
    AuthUserFile /usr/share/baculum/htdocs/protected/API/Config/baculum.users
    Require valid-user
</Location>
```

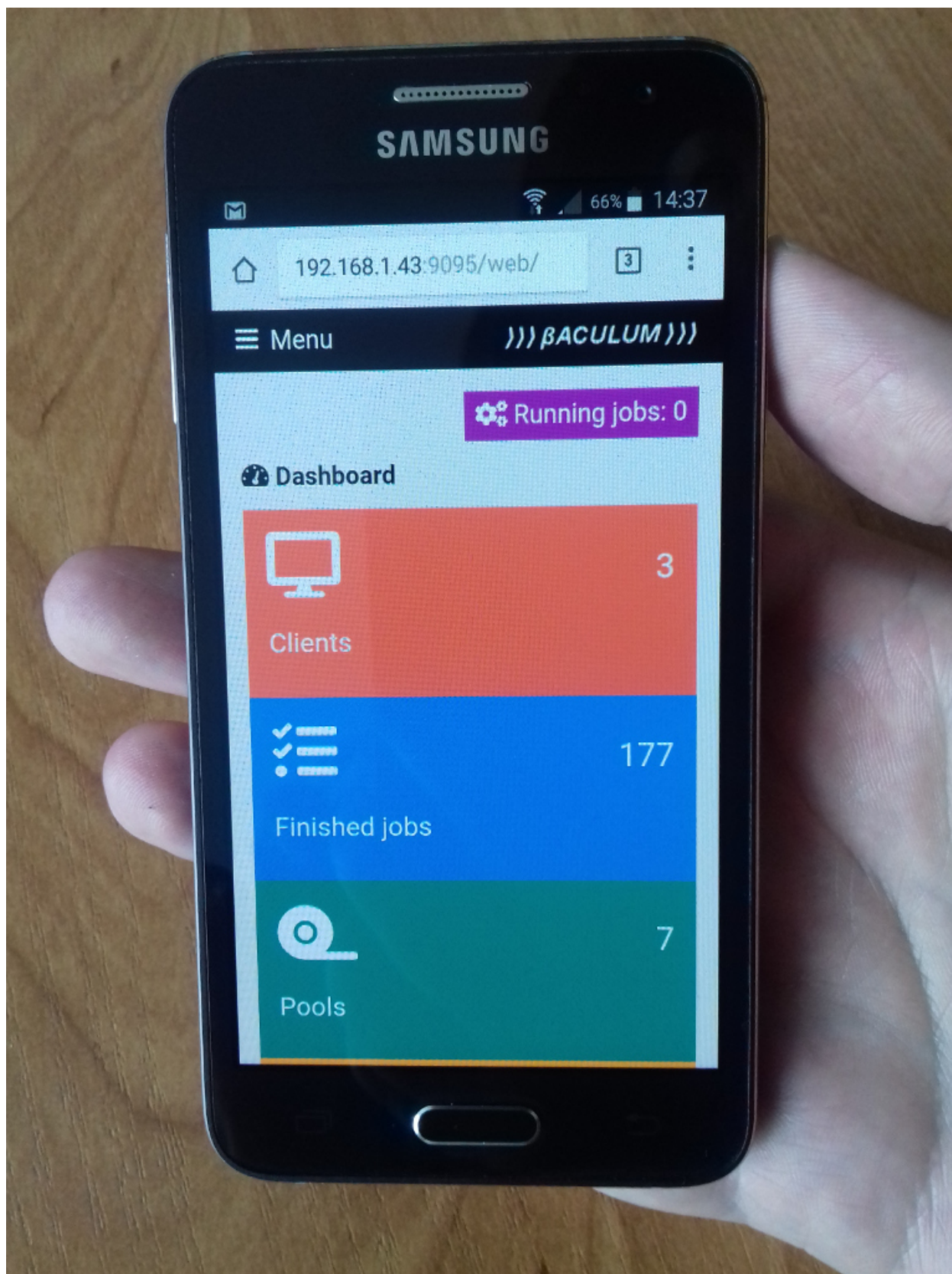
For Lighttpd the change is about uncommenting in API Lighttpd config lines as described in comment below.

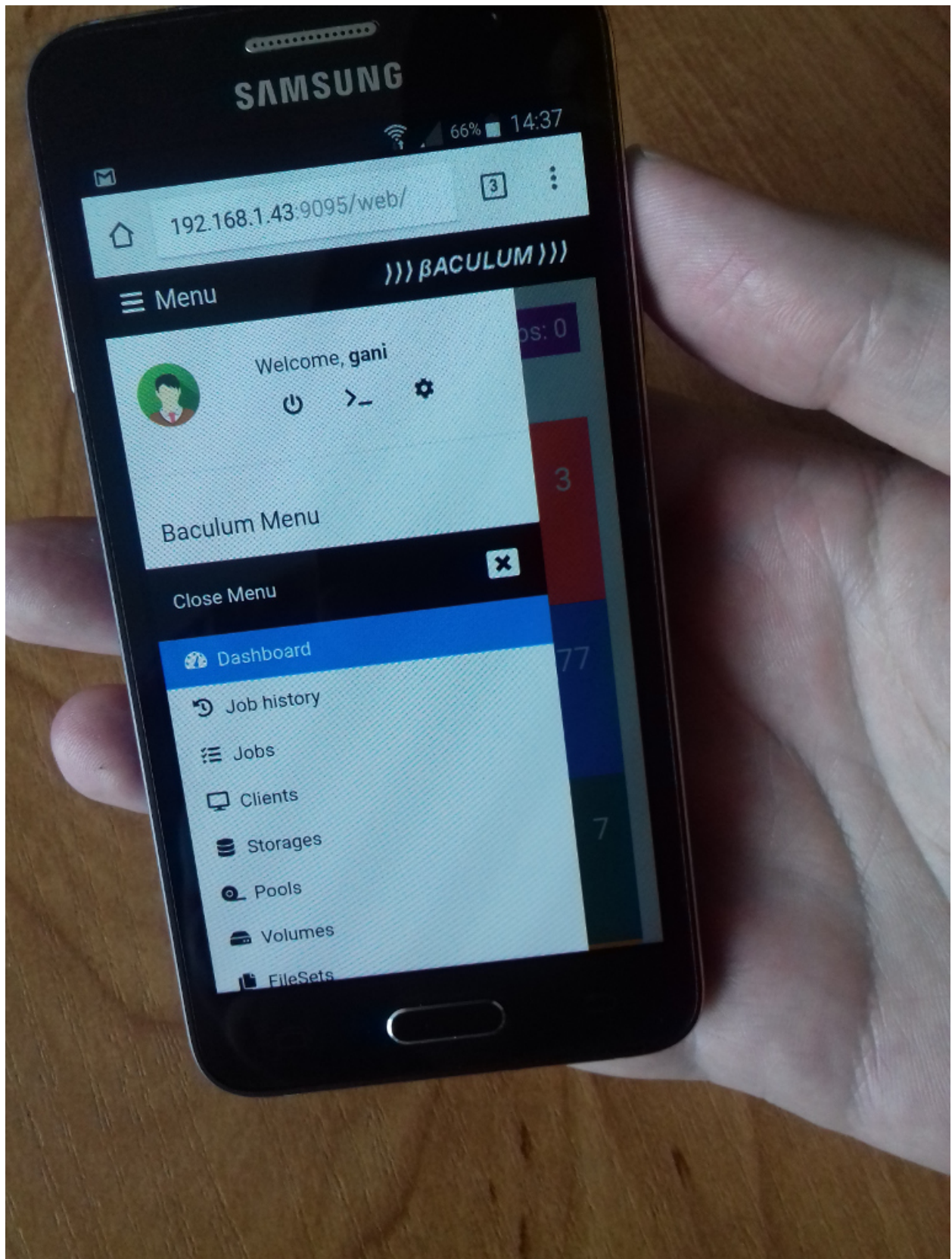
```
#
# Uncomment this line and closing braces below when you use OAuth2
#
# $HTTP["url"] =~ "^/web/page/.*$" {
#     auth.backend = "htpasswd"
#     auth.backend.htpasswd.userfile = "/usr/share/baculum/htdocs/protected/API/Config/baculum.use
#     auth.require = ( "/" => (
#         "method" => "basic",
#         "realm" => "Baculum Auth",
#         "require" => "valid-user"
#     )
# )
# }
```




2.13 Screenshots









Menu

Welcome, gani

Baculum Menu

Close Menu

Dashboard

Job history

Jobs

Clients

Storages

Pools

Volumes

FileSets

Schedules

Configure

Restore wizard

Graphs

Settings

Users

Running jobs: 0

Job history list

+ Add job

+ Run job

Show 10 entries

Search:

| JobId | Name | Type | Level | Start time | End time | Job status | Size | Files | Action |
|-------|-----------|--------|-------------|---------------------|---------------------|-------------|------|-------|--------------------|
| 4137 | I-PRACA | Backup | Incremental | 2018-05-23 10:00:02 | 2018-05-23 10:00:03 | <div></div> | 0 | 0 | <div>Details</div> |
| 4136 | dokumenty | Backup | Incremental | 2018-05-22 11:45:02 | 2018-05-22 11:45:09 | <div></div> | 0 | 0 | <div>Details</div> |
| 4135 | Przytnij | Admin | Unknown | 2018-05-21 19:30:02 | 2018-05-21 19:30:02 | <div></div> | 0 | 0 | <div>Details</div> |
| 4134 | dokumenty | Backup | Incremental | 2018-05-21 11:45:02 | 2018-05-21 11:45:08 | <div></div> | 0 | 0 | <div>Details</div> |
| 4133 | dokumenty | Backup | Incremental | 2018-05-18 11:45:02 | 2018-05-18 11:45:09 | <div></div> | 0 | 0 | <div>Details</div> |
| 4132 | I-PRACA | Backup | Incremental | 2018-05-18 10:00:02 | 2018-05-18 10:01:16 | <div></div> | 0 | 0 | <div>Details</div> |
| 4131 | Przytnij | Admin | Unknown | 2018-05-17 19:30:02 | 2018-05-17 19:30:02 | <div></div> | 0 | 0 | <div>Details</div> |
| 4130 | dokumenty | Backup | Incremental | 2018-05-17 11:45:02 | 2018-05-17 11:45:09 | <div></div> | 0 | 0 | <div>Details</div> |
| 4129 | I-PRACA | Backup | Incremental | 2018-05-17 10:00:03 | 2018-05-17 10:00:03 | <div></div> | 0 | 0 | <div>Details</div> |
| 4128 | Przytnij | Admin | Unknown | 2018-05-16 19:30:02 | 2018-05-16 19:30:02 | <div></div> | 0 | 0 | <div>Details</div> |

Showing 1 to 10 of 275 entries

Previous 1 2 3 4 5 ... 28 Next

Menu

Welcome, gani

Baculum Menu

Close Menu

Dashboard

Job history

Jobs

Clients

Storages

Pools

Volumes

FileSets

Schedules

Configure

Restore wizard

Graphs

Settings

Users

Running jobs: 0

Run job

Job to run:

Level:

Client:

FileSet:

Pool:

Storage:

Priority:

Accurate:

Estimate job

Run job

Search:

| Size | Files | Action |
|------|-------|--------------------|
| 0 | 0 | <div>Details</div> |
| 0 | 0 | <div>Details</div> |
| 0 | 0 | <div>Details</div> |
| 0 | 0 | <div>Details</div> |
| 0 | 0 | <div>Details</div> |
| 0 | 0 | <div>Details</div> |
| 0 | 0 | <div>Details</div> |
| 0 | 0 | <div>Details</div> |
| 0 | 0 | <div>Details</div> |
| 0 | 0 | <div>Details</div> |

Showing 1 to 10 of 275 entries

Previous 1 2 3 4 5 ... 28 Next

Menu

Welcome, gani

Running jobs: 0

Baculum Menu

Close Menu

Dashboard

Job history

Jobs

Clients

Storages

Pools

Volumes

FileSets

Schedules

Configure

Restore wizard

Graphs

Settings

Users

Job history details

[JobId 4134] Job: dokumenty

Actions

Configure job

Configure fileset

Configure schedule

Run job again

Delete

Refresh log

Restore

Log order

Job: dokumenty.2018-05-21_11.45.00_02 ✓

darkstar-dir JobId 4134: Start Backup JobId 4134, Job=dokumenty.2018-05-21_11.45.00_02

darkstar-dir JobId 4134: Using Device "Drive-MAIN-1" to write.

darkstar-sd JobId 4134: Fatal error: Authorization problem: Remote server requires TLS.

darkstar-fd JobId 4134: Fatal error: Authorization problem: Remote server did not advertize required TLS support.

darkstar-sd JobId 4134: Fatal error: Incorrect authorization key from File daemon at client rejected.

For help, please see: http://www.bacula.org/rel-manual/en/problems/Bacula_Frequently_Asked_Que.html

darkstar-sd JobId 4134: Fatal error: Unable to authenticate File daemon

darkstar-dir JobId 4134: Fatal error: Bad response to Storage command: wanted 2000 OK storage , got 2902 Bad storage

darkstar-dir JobId 4134: Error: Bacula darkstar-dir 9.0.6 (20Nov17):
Build OS: x86_64-pc-linux-gnu redhat Seven
JobId: 4134
Job: dokumenty.2018-05-21_11.45.00_02
Backup Level: Incremental, since=2018-05-04 11:45:55
Client: "darkstar-fd" 9.0.6 (20Nov17) x86_64-pc-linux-gnu,redhat,Seven)
FileSet: "dokumenty-fileset" 2015-11-17 11:45:00
Pool: "Incremental-VTL" (From Run Pool override)
Catalog: "MyCatalog" (From Client resource)
Storage: "VTL-MAIN" (From Pool resource)
Scheduled time: 21-mai-2018 11:45:00

Menu

Welcome, gani

Running jobs: 0

Baculum Menu

Close Menu

Dashboard

Job history

Jobs

Clients

Storages

Pools

Volumes

FileSets

Schedules

Configure

Restore wizard

Graphs

Settings

Users

New Job

Add new resource

Name:

My new job *

Description:

Type:

Backup *

Level:

Full ▼

Messages:

Standard ▼ *

Storage:

VTL-MAIN ▼ *

Pool:

Differential-VTL ▼ * 🗑️

NextPool:

TapeBackup ▼

FullBackupPool:

Full-VTL ▼

IncrementalBackupPool:

DifferentialBackupPool:

Client:

darkstar-fd *

Fileset:

www-fileset *





Chapter 3

Bacula Copyright, Trademark, and Licenses

There are a number of different licenses that are used in Bacula. If you have a printed copy of this manual, the details of each of the licenses referred to in this chapter can be found in the online version of the manual at <http://www.bacula.org> .

3.1 CC-BY-SA

The Creative Commons Attribution-ShareAlike 4.0 International License (CC-BY-SA) is used for this manual, which is a free and open license. Though there are certain restrictions that come with this license you may in general freely reproduce it and even make changes to it. However, rather than distribute your own version of this manual, we would much prefer if you would send any corrections or changes to the Bacula project.

The most recent version of the manual can always be found online at <http://www.bacula.org> .

3.2 GPL

The vast bulk of the source code is released under the Affero GNU General Public License version 3..

Most of this code is copyrighted: Copyright ©2000-2016, Kern Sibbald.

Portions may be copyrighted by other people. These files are released under different licenses which are compatible with the Bacula AGPLv3 license.

3.3 LGPL

Some of the Bacula library source code is released under the GNU Lesser General Public License. This permits third parties to use these parts of our code in their proprietary programs to interface to Bacula.

3.4 Public Domain

Some of the Bacula code, or code that Bacula references, has been released to the public domain. E.g. md5.c, SQLite.

3.5 Trademark

Bacula[®] is a registered trademark of Kern Sibbald.

3.6 Fiduciary License Agreement

Developers who have contributed significant changes to the Bacula code should have signed a Fiduciary License Agreement (FLA), which guarantees them the right to use the code they have developed, and also



ensures that the Free Software Foundation Europe (and thus the Bacula project) has the rights to the code. This Fiduciary License Agreement is found on the Bacula web site at:
<http://www.bacula.org/en/FLA-bacula.en.pdf>
 and if you are submitting code, you should fill it out then sent to:

Kern Sibbald
 Sentier du Lycee 1
 1009 Pully
 Switzerland

When you send in such a complete document, please notify me: kern at sibbald dot com.

3.7 Disclaimer

NO WARRANTY

BECAUSE THE PROGRAM IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE PROGRAM "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

3.8 Authors

The following people below have contributed to making this document what it is today:

Alexandre Baron `jbalexfr at users dot sourceforge dot net`, Arno Lehmann `jarnol at users dot sourceforge dot net`, Bastian Friedrich `jbastian dot friedrich at collax dot com`, Christopher S dot Hull `jcs at raidersolutions dot com`, Dan Langille Davide Franco `jdf franco at dfrc dot ch`, Dirk H Bartley `jdbartley at schupan dot com`, Eric Bollengier `jeric.bollengier at baculasystems dot com`, Frank Sweetser James Harper `bendigoit dot com dot au`, Jeremy C dot Reed `jjeremy-c-reed at users dot sourceforge dot net`, Jose Herrera `jherrerajs at yahoo dot com`, Jo Simoens Juan Luis Francis `jindpnday at users dot sourceforge dot net`, Karl Cunningham `jkarlec at users dot sourceforge dot net`, Kern Sibbald `jkern at sibbald dot com`, Landon Fuller `jlandonf at opendarwin dot org`, Lucas Di Pentima Ludovic Strappazon Meno Abels Nicolas Boichat Peter Buschman Philippe Chauvat `jphilippe.chauvat at baculasystems dot com`, Philipp Storz Richard Mortimer `jrichm at oldelvet dot org dot uk`, Robert Nelson `jrobertn at the-nelsons dot org`, Scott Barninger Sebastien Guilbaud Thomas Glatthor Thomas Mueller `jthomas at chaschperli dot ch`, Thorsten Engel `jthorsten dot engel at matrix-computer dot com`, Victor Hugo dos Santos `jvictorhugops at users dot sourceforge dot net`



Creative Commons Attribution-ShareAlike 4.0 International

Attribution-ShareAlike 4.0 International

Creative Commons Corporation (Creative Commons) is not a law firm and does not provide legal service.

Using Creative Commons Public Licenses

Creative Commons public licenses provide a standard set of terms and conditions that creators and other

Considerations for licensors: Our public licenses are intended for use by those authorized to grant

Considerations for the public: By using one of our public licenses, a licensor grants the public

Creative Commons Attribution-ShareAlike 4.0 International Public License

By exercising the Licensed Rights (defined below), You accept and agree to be bound by the terms and

Section 1 Definitions.

Adapted Material means material subject to Copyright and Similar Rights that is derived from or based on the
 Adapter's License means the license You apply to Your Copyright and Similar Rights in Your contribution
 BY-SA Compatible License means a license listed at creativecommons.org/compatiblelicenses, approved by Creative Commons as a
 Copyright and Similar Rights means copyright and/or similar rights closely related to copyright including
 Effective Technological Measures means those measures that, in the absence of proper authority, prevent or
 Exceptions and Limitations means fair use, fair dealing, and/or any other exception or limitation
 License Elements means the license attributes listed in the name of a Creative Commons Public License
 Licensed Material means the artistic or literary work, database, or other material to which the Licensed Rights
 Licensed Rights means the rights granted to You subject to the terms and conditions of this Public License
 Licensor means the individual(s) or entity(ies) granting rights under this Public License.
 Share means to provide material to the public by any means or process that requires permission under applicable
 Sui Generis Database Rights means rights other than copyright resulting from Directive 96/9/EC of the European
 You means the individual or entity exercising the Licensed Rights under this Public License. You does not

Section 2 Scope.

License grant.

Subject to the terms and conditions of this Public License, the Licensor hereby grants You a license to:
 reproduce and Share the Licensed Material, in whole or in part; and
 produce, reproduce, and Share Adapted Material.

Exceptions and Limitations. For the avoidance of doubt, where Exceptions and Limitations apply, no license is granted
 Term. The term of this Public License is specified in Section 6(a).

Media and formats; technical modifications allowed. The Licensor authorizes You to exercise the Licensed Rights
 Downstream recipients.

Offer from the Licensor. Licensed Material. Every recipient of the Licensed Material automatically receives an offer from the Licensor to adapt the Licensed Material for any medium or format, provided that You
 Additional offer from the Licensor. Adapted Material. Every recipient of Adapted Material automatically receives an offer from the Licensor to make and share a new adaptation under the same Public License.

No downstream restrictions. You may not offer or impose any additional or different terms or conditions on the exercise of the Licensed Rights by downstream recipients.

No endorsement. Nothing in this Public License constitutes or may be construed as permission to assert or imply the

Other rights.

Moral rights, such as the right of integrity, are not licensed under this Public License, nor are patent and trademark rights.
 Patent and trademark rights are not licensed under this Public License.

To the extent possible, the Licensor waives any right to collect royalties from You for the exercise of the Licensed Rights, provided that You agree to waive any right to collect royalties from other parties for the exercise of the Licensed Rights, and that You agree to indemnify the Licensor for losses and damages caused by You or any other party's failure to so waive royalties.

Section 3 License Conditions.

Your exercise of the Licensed Rights is expressly made subject to the following conditions.

Attribution.

If You Share the Licensed Material (including in modified form), You must:

- retain the following if it is supplied by the Licensor with the Licensed Material:
 - identification of the creator(s) of the Licensed Material and any others designated a copyright notice;
 - a notice that refers to this Public License;
 - a notice that refers to the disclaimer of warranties;
 - a URI or hyperlink to the Licensed Material to the extent reasonably practicable;
- indicate if You modified the Licensed Material and retain an indication of any previous modification;
- indicate the Licensed Material is licensed under this Public License, and include the text "Licensed under a Creative Commons license";

You may satisfy the conditions in Section 3(a)(1) in any reasonable manner based on the medium in which You share the Licensed Material. If requested by the Licensor, You must remove any of the information required by Section 3(a) to the extent that removal does not result in Your ShareAlike.

In addition to the conditions in Section 3(a), if You Share Adapted Material You produce, the following conditions apply:

- The Adapter's License You apply must be a Creative Commons license with the same License Elements as this Public License, and You must include the text of, or the URI or hyperlink to, the Adapter's License You apply. You may not offer or impose any additional or different terms or conditions on, or apply any

Section 4 Sui Generis Database Rights.

Where the Licensed Rights include Sui Generis Database Rights that apply to Your use of the Licensed Material, the conditions in Section 3(a) apply to Your use of the Licensed Material.

For the avoidance of doubt, Section 2(a)(1) grants You the right to extract, reuse, reproduce, a substantial portion of the database contents in a database in which You share the Licensed Material. You must comply with the conditions in Section 3(a) if You Share all or a substantial portion of the database contents in a database in which You share the Licensed Material.

For the avoidance of doubt, this Section 4 supplements and does not replace Your obligations under the applicable law governing database rights.

Section 5 Disclaimer of Warranties and Limitation of Liability.

Unless otherwise separately undertaken by the Licensor, to the extent possible, the Licensor offers the Licensed Material as-is and as-available, and makes no representations or warranties of any kind concerning the Licensed Material, whether express, implied, or otherwise. To the extent possible, in no event will the Licensor be liable to You on any legal theory (including tort, contract, or otherwise) for damages, losses, costs, expenses, or any other harms, past or future, arising directly or indirectly from the Licensed Material, whether or not caused in whole or in part by the Licensed Material.

The disclaimer of warranties and limitation of liability provided above shall be interpreted in favor of the Licensor.

Section 6 Term and Termination.

This Public License applies for the term of the Copyright and Similar Rights licensed here. However, if the applicable law provides for a different term, the term of the Public License shall be the term provided by the applicable law.

Where Your right to use the Licensed Material has terminated under Section 6(a), it reinstates: automatically as of the date the violation is cured, provided it is cured within 30 days of Your discovery of the violation; or upon express reinstatement by the Licensor.

For the avoidance of doubt, this Section 6(b) does not affect any right the Licensor may have to enforce or otherwise terminate the License. For the avoidance of doubt, the Licensor may also offer the Licensed Material under separate terms or conditions. Sections 1, 5, 6, 7, and 8 survive termination of this Public License.

Section 7 Other Terms and Conditions.

The Licensor shall not be bound by any additional or different terms or conditions communicated by You or any other entity. Any arrangements, understandings, or agreements regarding the Licensed Material not stated herein are hereby acknowledged.

Section 8 Interpretation.

For the avoidance of doubt, this Public License does not, and shall not be interpreted to, reduce the scope of any rights or licenses that may apply to the Licensed Material by operation of any applicable law or treaty. To the extent possible, if any provision of this Public License is deemed unenforceable, it shall nevertheless remain in effect. No term or condition of this Public License will be waived and no failure to comply consented to. Nothing in this Public License constitutes or may be interpreted as a limitation upon, or waiver of, any applicable law or treaty.



3.8. *AUTHORS*

Creative Commons is not a party to its public licenses. Notwithstanding, Creative Commons may elect Creative Commons may be contacted at creativecommons.org.