Benchmarking Suite Documentation

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The Benchmarking Suite is an all-in-one solution for benchmarking cloud services simulating different typical application behaviours and comparing the results on different cloud providers. It wraps a set of representative, de-facto standard and widely used third-party benchmarking tools and relies on them for the workload simulation and performance measurement.

The Benchmarking Suite automates the benchmarking process managing the allocation and de-allocation of necessary resources, the installation and execution of the benchmarking tools and the storage of data.

It has been designed to be extendible and allow an easy integration of new third-party benchmarking tools and cloud services. Data collected and stored during the tests execution is homogenized and aggregated on different higher-level metrics (e.g. average value) allowing performance comparisons among different providers and/or different dates.

The Benchmarking Suite development has been funded by two European reasearch and innovation projects: ARTIST[1] and CloudPerfect[2].

[1] http://www.artist-project.eu/
[2] https://cloudperfect.eu/

CHAPTER 1

License

The Benchmarking Suite is an open source product released under the Apache License v2.0[3].

[3] https://www.apache.org/licenses/LICENSE-2.0

CHAPTER 2

Topics

2.1 Quick Start

2.1.1 Install

The Benchmarking Suite is package and distributed through PyPI[1].

Important: The Benchmarking Suite requires Python 3.5+. If it is not the default version in you system, it is recommended to create a virtualenv:

```
virtualenv -p /usr/bin/python3.5 benchmarking-suite
source benchsuite/bin/activate
```

Let's start by installing the command line tool and the standard library:

```
$ pip install benchsuite.stdlib benchsuite.cli
```

This will make available the `benchsuite` bash command and will copy the standard benchmark tests configuration into the default configuration location (located under `~/.config/benchmarking-suite/benchmarks`).

2.1.2 Configure

Before executing a benchmark, we have to configure at least one Service Provider. The `benchsuite.stdlib` provides some template (located under `~/.config/benchmarking-suite/providers`).

For instance, for Amazon EC2 we can start from the template and complete it:

```
cp ~/.config/benchmarking-suite/providers/amazon.conf.example my-amazon.conf
```

[1] https://python.org/pypi/benchsuite.core/

Open and edit `my-amazon.conf`

```
[provider]
class = benchsuite.provider.libcloud.LibcloudComputeProvider

type = ec2

access_id = <your access_id>
secret_key = <your secret_key>

region = us-west-1
ex_security_group_ids = <id of the security group>
ex_subnet = <id of the subnet>

[ubuntu_micro]
image = ami-73f7da13
size = t2.micro
key_name = <your keypair name>
key_path = <path to your private key file>
vm_user = ubuntu
platform = ubuntu_16
```

In this case we will provide this file directly to the command line tool, but we can also configure our own configuration directory, put all our service providers and benchmarking tests configuration there and refer to them by name (see XXX seciton).

2.1.3 Run!

Now you can execute your first benchmark test:

```
benchsuite multiexec --provider my-amazon.conf --service ubuntu_micro ycsb-
↪mongodb:WorkloadA
```

2.1.4 Go REST

Enable the REST server is very simple:

```
pip install benchsuite.rest
benchsuite-rest start
tail -f benchsuite-rest.log
```

2.1.5 References

2.2 Architecture

The Benchmarking Suite is composed by five main components summarized in the following diagram:

- **Core**: defines the main model, the extension framework for the benchmarks and the Cloud providers and the main data representation types;
- **REST**: a REST server to access all the Benchmarking Suite functionalities;
- **CLI**: a command line tool (bash-compatible) to access all the Benchmarking Suite functionalities;

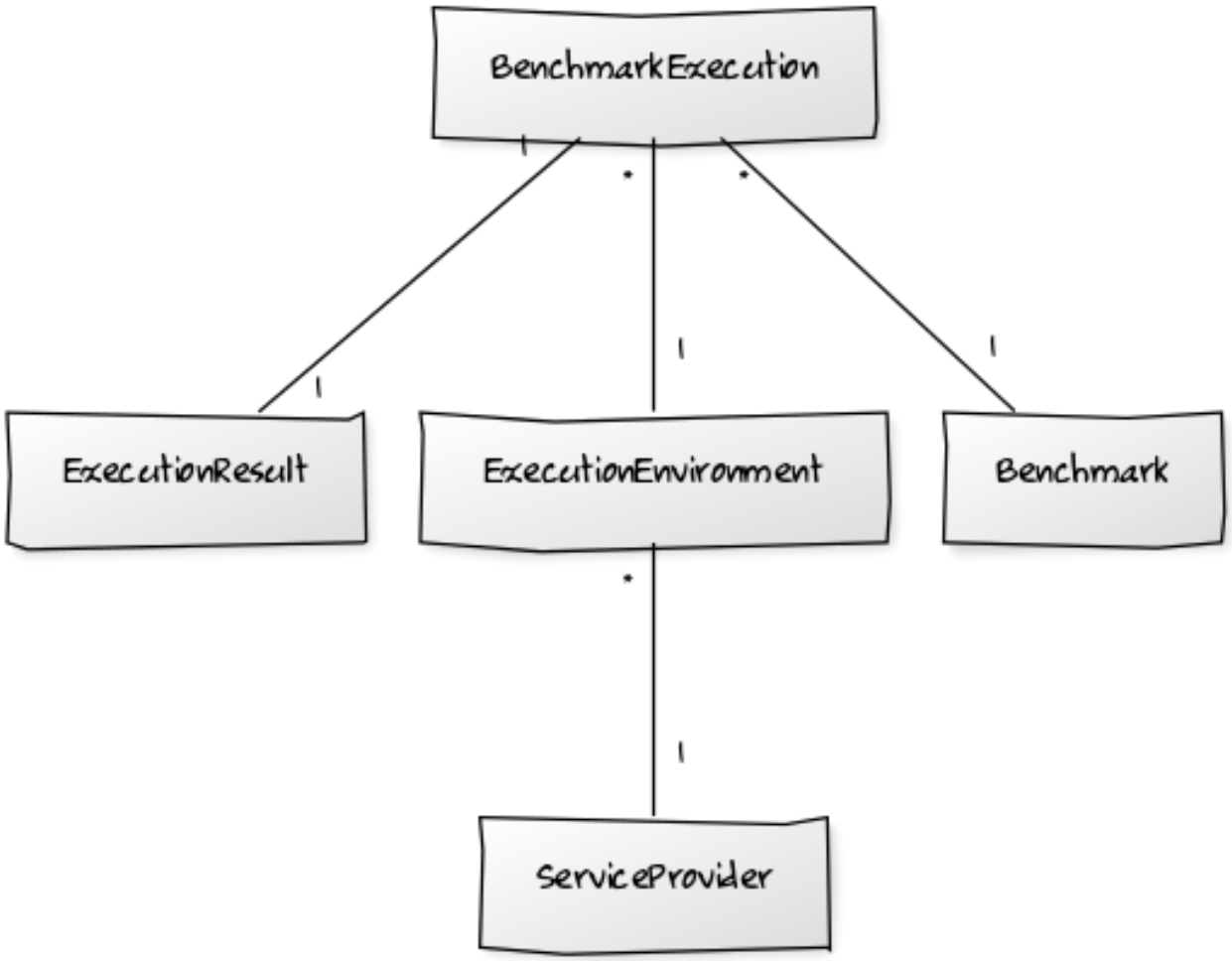
- **Std Library**: a set of selected benchmark tools, including their configurations and the implementation of the required wrapping scripts for the execution and the parsing of results;
- **Backend Connectors**: a set of connectors to store the Benchmarking Suite executions results on different storage technologies (e.g. MySQL, MongoDB).

The *Core* component is the only required component, the other components are optional. However the Benchmarking Suite installation will miss the functionalities of not-installed modules (e.g. if the *Backend Connectors* is not installed, the execution results will not be stored).

The *User's Cloud Configuration* is the required configuration of the Cloud Providers that the Benchmarking Suite needs to be able to access the *Target Cloud Provider*. It can be specified either as configuration file or as parameter in the execution requests (through the REST or CLI components). Refer to section providers for further details

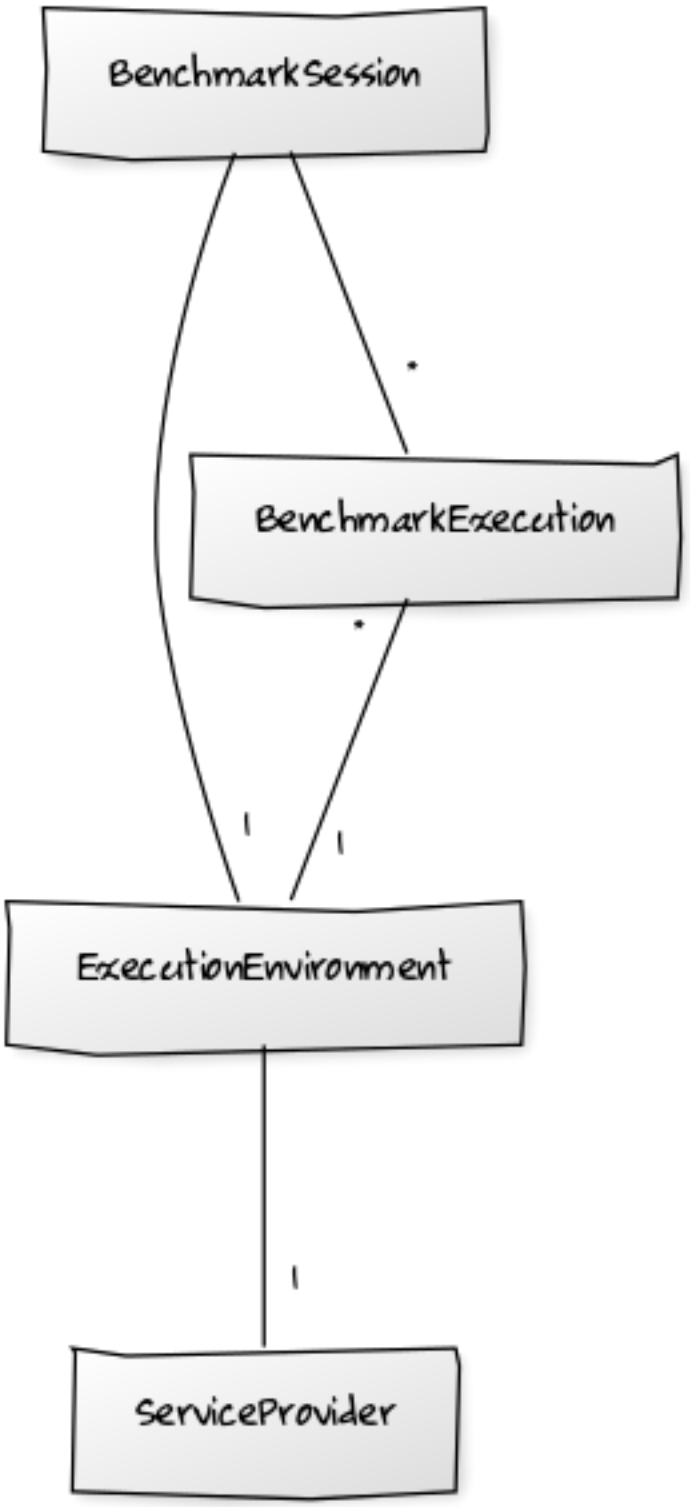
2.2.1 Domain Model

The core concept in the Benchmarking Suite is the **BenchmarkExecution**. It represents the execution of a **Benchmark** test against an **ExecutionEnvironment** provided from a **ServiceProvider** and produces an **ExecutionResult**.



Note: For instance, following this model we can easily model the execution of YCSB.WorkloadA (the *Benchmark*) on the Virtual Machine with ip=50.1.1.1 (the *ExecutionEnvironment*) provided by Amazon EC2 (the *ServiceProvider*).

Since it is frequent to execute multiple tests against the same Service Provider, the Benchmarking Suite has also the concept of **BenchmarkingSession**. that can gropu one or more executions of the ServiceProvider, using the same ExecutionEnvironment.



2.2.2 Software Modules

In order to address all the different use cases and the installation necessities, the Benchmarking Suite is distributed in five different software modules that can be installed separately:

`benchsuite.core`	the core library (all other modules depend on it) with the definition of types and the fundamental framework for the extension of the Benchmarking Suite
`benchsuite.stdlib`	a collection of benchmark tests configuration files and support for some Cloud Providers
`benchsuite.cli`	a bash command line tool to manage tests and results
`benchsuite.rest`	an HTTP server and a REST API to interact with the Benchmarking Suite
`benchsuite.backend`	connectors for the supported storage backends

2.3 Benchmarks

2.3.1 Benchsuite StdLib

The Benchmarking Suite comes with a set of benchmark tests ready to be executed included in the StdLib module. The following table summarizes the tools available and their compatibility with different operating system.

Tool	Version	CentOS	Ubuntu 14
CFD	1.0		✓
DaCapo	9.12	✓	✓
Filebench	1.4.9.1	✓	✓
YCSB-MySQL	0.12.0	✓	✓
YCSB-MongoDB	0.11.0	✓	✓

Metrics

Each tool produces a set of metrics that are extracted by the Benchmarking Suite and included in the results database. The following table reports for each tool the metrics extracted and a brief description of its meaning.

Tool	Metric	Unit	Description
CFD	duration	s	The overall duration of the test
Filebench[1]	duration	s	The overall duration of the test
	ops		The sum of all the operations (of any type) executed
	ops_throughput	ops/s	The average number of operations executed per second
	throughput	MB/s	The average throughput in MegaByte of the operations
	cputime	µs	The average cpu time in µs taken by each operation
	latency_avg	µs	The average latency of each operation
YCSB[2]	duration	s	The overall duration of the test
	ops_throughput	ops/s	The average number of operation per second executed
	read_ops		The number of read operations executed
	read_latency_avg	µs	The average latency for the read operations
	read_latency_min	µs	The minimum latency for the read operations
	read_latency_max	µs	The maximum latency for the read operations
	read_latency_95	µs	The maximum latency for the 95% of the read operations
	read_latency_99	µs	The maximum latency for the 99% of the read operations
	insert_ops		The number of insert operations executed
	insert_latency_avg	µs	The average latency for the insert operations
	insert_latency_min	µs	The minimum latency for the insert operations
	insert_latency_max	µs	The maximum latency for the insert operations
	insert_latency_95	µs	The maximum latency for the 95% of the insert operations
	insert_latency_99	µs	The maximum latency for the 99% of the insert operations
	update_ops		The number of update operations executed
	update_latency_avg	µs	The average latency for the update operations
	update_latency_min	µs	The minimum latency for the update operations
	update_latency_max	µs	The maximum latency for the update operations
	update_latency_95	µs	The maximum latency for the 95% of the update operations
	update_latency_99	µs	The maximum latency for the 99% of the update operations
DaCapo	duration	s	The overall duration of the test

2.4 Executions

2.4.1 Single Step Execution

The single step execution executes one or more benchmarks

2.4.2 Step-by-Step Execution

The Step-by-Step execution allows to

This is of particular interest if, during the execution of the benchmarks, it is needed to run other tools like profilers

[1] More about the Filebench metrics can be found at https://github.com/filebench/filebench/wiki/Collected-metrics
[2] More about the YCSB metrics can be found at https://github.com/brianfrankcooper/YCSB/wiki/Running-a-Workload

2.5 Command line tool

2.5.1 Install

The Benchmarking Suite Command line tool can be installed with:

```
pip install benchsuite.cli
```

If the installation was successful, the `benchsuite` command should be in your path.

2.5.2 Usage and Examples

Create a new session

To create a new session, the Benchmarking Suite needs two information: the provider configuration and the service type. The command line tool offers multiple options to specify these parameters.

Provider Configuration

There are different alternatives:

1. specify a name with the `--provider` option (e.g. `--provider myamazon`). In this case, a provider configuration file named `<name>.conf` will be searched in the configuration path;
2. specify a filename in the `--provider` option (e.g. `--provider /path/myamazon.conf`). The configuration file specified will be used;
3. store the provider configuration in the `BENCHSUITE_PROVIDER` environment variable.

As example, the following invocations load the same provider configuration:

```
$ benchsuite new-session --provider my-amazon.conf ...
```

```
$ benchsuite new-session --provider $BENCHSUITE_CONFIG_FOLDER/providers/my-amazon.
↪conf ...
```

```
$ export BENCHSUITE_PROVIDER=```cat $BENCHSUITE_CONFIG_FOLDER/providers/my-amazon.
↪conf```
$ benchsuite new-session ...
```

Service Type

The service type can be specified using the `--service-type` option (e.g. `--service-type ubuntu_micro`). The value of the service type must be one of the ones defined in the provider configuration. Alternatively the ‘‘BENCHSUITE_SERVICE_TYPE‘ enviornment variable can be used.

If neither the `--service-type` option nor the ‘‘BENCHSUITE_SERVICE_TYPE‘ enviornment variable are specified and the provider configuration defines only ONE service type, that one will be used, otherwise the invocation will fail.

2.5.3 Command Line Tool Documentation

This is an autogenerated documentation from the Python `argparse` options.

```
usage: benchsuite [-h] [--verbose] [--quiet] [--config CONFIG]
                  {shell,new-session,new-exec,prepare-exec,run-exec,list-sessions,
↪list-providers,list-benchmarks,destroy-session,list-execs,collect-exec,multiexec}
                  ...
```

Named Arguments

--verbose, -v	print more information (3 levels)
--quiet, -q	suppress normal output Default: False
--config, -c	foo help

Sub-commands:

shell

Starts an interactive shell

```
benchsuite shell [-h]
```

new-session

Creates a new benchmarking session

```
benchsuite new-session [-h] [--provider PROVIDER]
                       [--service-type SERVICE_TYPE] [--property PROPERTY]
                       [--user USER] [--tag TAG]
```

Named Arguments

--provider, -p	The name for the service provider configuration or the filepath of the provider configuration file. Alternatively, the provider configuration can be specified in the environment variable BENCHSUITE_PROVIDER (the content of the variable must be the actual configuration not the filepath)
--service-type, -s	The name of one of the service types defined in the provider configuration. Alternatively, it can be specified in the BENCHSUITE_SERVICE_TYPE environment varaible
--property, -P	Add a user defined property to the session. The property must be expressed in the format <name>=<value>
--user, -u	sets the "user" property. It is a shortcut for "–property user=<name>
--tag, -t	sets one or more session tags. Internally, tags are stored as properties

new-exec

Creates a new execution

```
benchsuite new-exec [-h] session tool workload
```

Positional Arguments

session	a valid session id
tool	a valid benchmarking tool
workload	a valid benchmarking tool workload

prepare-exec

Executes the install scripts for an execution

```
benchsuite prepare-exec [-h] id
```

Positional Arguments

id	a valid id of the execution

run-exec

Executes the execute scripts for an execution

```
benchsuite run-exec [-h] [--storage-config STORAGE_CONFIG] [--async] id
```

Positional Arguments

id	a valid id of the execution

Named Arguments

--storage-config, -r	Specify a custom location for the storage configuration file
--async	start the execution of the scripts and return (do not wait for the execution to finish) Default: False

list-sessions

a help

```
benchsuite list-sessions [-h]
```

list-providers

a help

```
benchsuite list-providers [-h]
```

list-benchmarks

a help

```
benchsuite list-benchmarks [-h]
```

destroy-session

a help

```
benchsuite destroy-session [-h] id
```

Positional Arguments

id bar help

list-execs

lists the executions

```
benchsuite list-execs [-h]
```

collect-exec

collects the outputs of an execution

```
benchsuite collect-exec [-h] id
```

Positional Arguments

id the execution id

multiexec

Execute multiple tests in a single benchmarking session

```
benchsuite multiexec [-h] [--provider PROVIDER] [--service-type SERVICE_TYPE]
                     [--storage-config STORAGE_CONFIG] [--property PROPERTY]
                     [--user USER] [--tag TAG] [--failonerror]
                     tests [tests ...]
```

Positional Arguments

tests	one or more tests in the format <tool>[:<workload>]. If workload is omitted, all workloads defined for that tool will be executed

Named Arguments

--provider, -p	The name for the service provider configuration or the filepath of the provider configuration file
--service-type, -s	The name of one of the service types defined in the provider configuration. If not specified, all service types will be used
--storage-config, -r	Specify a custom location for the storage configuration file
--property, -P	Add a user defined property to the session. The property must be expressed in the format <name>=<value>
--user, -u	sets the "user" property. It is a shortcut for "–property user=<name>
--tag, -t	sets one or more session tags. Internally, tags are stored as properties
--failonerror, -e	If set exit immediately if one of the tests fail. It is false by default Default: False

2.6 REST Server

2.6.1 Quick Start

This short tutorial shows how to use the API to perform a step-by-step benchmarking test.

First, we need to create a new session. This can be done making a `POST` request to `/api/v1/sessions` providing the provider name and service type.

```
curl -X POST --header 'Content-Type: application/json' --header 'Accept: application/
↪json' -d '{\
    "provider": "my-provider",\
    "service": "my-service-type"\
}' http://localhost:5000/api/v1/sessions
```

Alternatively, the provider configuration can be provided directly in the request payload. For instance, a typical request to create a benchmarking session for Amazon EC2 would be:

```
curl -X POST --header 'Content-Type: application/json' --header 'Accept: application/
↪json' -d '{\
    "config": {\
        "provider": {\
                "class": "benchsuite.stdlib.provider.libcloud.LibcloudComputeProvider
↪",\
                    "name": "ec2-ggiammat",\
                    "driver": "ec2",\
                    "access_id": "<your_access_id>",\
                    "secret_key": "<your_key>",\
                    "region": "us-west-1"\
            },\
```

```
            "centos_micro": {\
                    "image": "ami-327f5352",\
                    "size": "t2.micro",\
                    "vm_user": "ec2-user",\
                    "platform": "centos_6",\
                    "key_name": "<keypair_name>",\
                    "ssh_private_key": "----BEGIN RSA PRIVATE KEY-----\nIIE... [...] .
↪..6alL\n-----END RSA PRIVATE KEY-----"\
            }\
    }\
}' http://localhost:5000/api/v1/sessions/
```

Important: Providing the configuration directly in the request payload, your credentials will be sent over the network unencrypted. Do it only when the server is running in a trusted environment!

Note: The ssh private key msut be provided on a sinlge line (json does not support multiline values), but the line ends must be preserved. A convenient method to generate this string in bash is:

```
sed -E ':a;N;$!ba;s/\r{0,1}\n/\\n/g' my-key.pem
```

The response will contain the `id` of the session created:

```
{
    "id": "58920c6c-c57c-4c55-a227-0ab1919e83be",
    [...]
}
```

Now we can create a new benchmarking test execution in the session (note that the id of the session is used in the request URL:

```
curl -X POST --header 'Content-Type: application/json' --header 'Accept: application/
↪json' -d '{ \
    "tool": "idle", \
    "workload": "idle30" \
}' http://localhost:5000/api/v1/sessions/58920c6c-c57c-4c55-a227-0ab1919e83be/
↪executions/
```

The response will contain (along with other execution details) the `id` of the execution:

```
{
    "id": "253d9544-b3db-11e7-8bc2-742b62857160",
    [...]
}
```

With this execution id we can now invoke the *prepare* step that will create the resources on the provider, install the necessary tools and load the workloads:

```
curl -X POST --header 'Content-Type: application/json' --header 'Accept: application/
↪json' http://localhost:5000/api/v1/executions/253d9544-b3db-11e7-8bc2-742b62857160/
↪prepare
```

Finally, we can invoke the *run* step:

```
curl -X POST --header 'Content-Type: application/json' --header 'Accept: application/
↪json' http://localhost:5000/api/v1/executions/253d9544-b3db-11e7-8bc2-742b62857160/
↪run
```

The response of the *prepare* and *run* steps contain the start time and the duration of the operation:

```
{
    "started": "2017-10-18 08:18:33",
    "duration": "32.28253793716431"
}
```

The same session can be used to run multiple executions. At the end, the session and the resources created (e.g. VM) can be destroyed using the DELETE operation:

```
curl -X DELETE --header 'Accept: application/json' http://localhost:5000/api/v1/
↪sessions/58920c6c-c57c-4c55-a227-0ab1919e83be
```

2.6.2 Swagger Doc

This documentation is autogenerated from the Swagger API Specification using sphinx-swaggerdoc.

A better documentation for the REST API can be found directly in the REST Server:

1. Launch the server
2. Open http://localhost:5000/api/v1/

benchmarks

GET /benchmarks/

Parameters

Name	Position	Description	Type
X-Fields	header	An optional fields mask	string

GET /benchmarks/{benchmark_id}

Parameters

Name	Position	Description	Type
X-Fields	header	An optional fields mask	string
benchmark_id	path		string

---

executions

GET /executions/{exec_id}

Parameters

Name	Position	Description	Type
X-Fields	header	An optional fields mask	string
exec_id	path		string

GET /executions/

Parameters

Name	Position	Description	Type
X-Fields	header	An optional fields mask	string

POST /executions/{exec_id}/prepare

Parameters

Name	Position	Description	Type
X-Fields	header	An optional fields mask	string
exec_id	path		string

POST /executions/{exec_id}/run

Parameters

Name	Position	Description	Type
X-Fields	header	An optional fields mask	string
exec_id	path		string

---

providers

GET /providers/

Parameters

Name	Position	Description	Type
X-Fields	header	An optional fields mask	string

---

sessions

DELETE /sessions/{session_id}

Parameters

Name	Position	Description	Type
session_id	path	The id of the session	string

GET /sessions/{session_id}

Parameters

Name	Position	Description	Type
X-Fields	header	An optional fields mask	string
session_id	path	The id of the session	string

GET /sessions/

Parameters

Name	Position	Description	Type
X-Fields	header	An optional fields mask	string

POST /sessions/

Parameters

Name	Position	Description	Type
payload	body		
X-Fields	header	An optional fields mask	string

GET /sessions/{session_id}/executions/

Parameters

Name	Position	Description	Type
X-Fields	header	An optional fields mask	string
session_id	path		string

POST /sessions/{session_id}/executions/

Parameters

Name	Position	Description	Type
payload	body		
X-Fields	header	An optional fields mask	string
session_id	path		string

default

2.7 Docker

The Benchmarking Suite is also distributed in two different Docker containers. They are available at https://cloud.docker.com/app/benchsuite/repository/list.

2.7.1 benchsuite-multiexec

This container can be used to run benchmarks in batch mode.

Get (or update) the image with:

```
docker pull benchsuite/benchsuite-multiexec
```

Run the container binding the provider and storage (optional) configuration files stored in the local machine and passing the list of tests to execute as parameters (e.g. `idle:idle5`):

```
docker run -v /home/mypc/amazon.conf:/provider.conf -v /home/mypc/storage.conf:/
↪storage.conf benchsuite/benchsuite-multiexec:dev -p provider.conf -s centos_micro␣
↪idle:idle5
```

In case the storage service is running on the local machine, it could be necessary to use the `--net=host` option to reach it.

Alternatively, provider and storage configurations can be specified through environment variables: `BENCHSUITE_PROVIDER` and `BENCHSUITE_STORAGE_CONFIG` respectively.

```
docker run -e BENCHSUITE_PROVIDER="[myconf]...." -e BENCHSUITE_SERVICE_TYPE="centos_
↪micro" -v /home/mypc/storage.conf:/storage.conf benchsuite/benchsuite-multiexec:dev␣
↪idle:idle5
```

2.7.2 benchsuite-rest-service

This image contains the Benchmarking Suite REST SERVER (see rest-server-doc section). When started, the container exposes the REST service on port 5000.

To run the container, just use the Docker CLI:

```
docker run benchsuite/benchsuite-rest-server
```

The service reads the Benchmarking Suite bs-configuration from the `/` directory of the container. For instance, to provide a configuration for the storage (to persist results in the db) mount a file in the container named `/storage.conf` or `/storage.json`:

```
docker run -v my-storage.conf:/storage.conf benchsuite/benchsuite-rest-server
```

Also providers configuration files can be mounted in the container in the same way:

```
docker run -v my-provider.conf:/providers/my-provider.conf benchsuite/benchsuite-rest-
↪server
```

2.8 Scheduler

The Benchsuite Scheduler allows to schedule the execution of benchmarking tests at pre-fixed intervals. It needs:

- a MongoDB instance to load the **schedules** (see below), keep its state, log the executions and save the results
- a Docker Swarm instance to launch the tests (the *benchsuite-multiexec* Docker image is used) and to run the scheduler itself

The scheduler works in this way:

1. loads from a MongoDB collection the schedules and creates a job for each schedule (it uses APScheduler[1] under the hood). The jobs are kept in sync and refreshed periodically
2. sets-up a timer for each job accordingly with the time interval defined in the schedule
3. when its the time to execute a job, launchs a *benchsuite-multiexec* and configure it to execute the needed tests and to store the results on another MongoDB collection

2.8.1 Schedules

The **schedules** are the main input to the scheduler and models the tests that needs to be scheduled. Each schedule contains two types of information: the parameters of the tests and the timing information. Each schedule is expected to be a MongoDB document with this structure:

```
{
    "id" : "ec2-123asd-filebench",
    "active": true,
    "provider_config_secret" : "ec2",
    "username" : "ggiammat",
    "tests" : [
        "filebench",
        "ycsb-mysql",
        "dacapo"
    ],
    "tags" : [
        "scheduled"
    ],
    "env" : {
        "MYVAR": "val"
    },
    "interval" : {
        "hours" : 1
    }
}
```

It contains:

- `id`: a unique id
- `active`: defined whether this schedule should be considered by the scheduler or not
- `provider_config_secret`: the name (or the id) of the Docker secret that contains the Cloud Provider configuration. It uses the Docker secrets because the configuration also contains the user credentials to access the Cloud Provider
- `username`: an identifier of the user that is requesting the execution. It will be saved also in the benchmarking results

[1] https://apscheduler.readthedocs.io/en/latest/

- `tests`: a list of test names to execute to be passed to the benchsuite `multiexec` command (see *Command Line Tool Documentation*)
- `tags`: a list of tags to assign to the results
- `env`: key-value pairs that define enviornment variables to be available in the execution environment during the execution
- `interval`: the time interval between two executions. The accepted keys are: `weeks`, `days`, `hours`, `minutes` and `seconds`. Multiple keys can be combined and if not specified, the default value is 0

New schedules are automatically loaded and they are rescheduled if a change is detected.

2.8.2 Configuration

The schduler accepts multiple parameters. Some of them are mandatory, while some other have a default value.

All the parameters can be specified in a config file in the format

```
PARAM1=val1
PARAM2=val2
...
```

or specified as environment variable (the latter overrides the former).

The list of mandatory parameters are:

- `DB_HOST`: the connection string to the MongDB (e.g. "mongodb://localhost:27017"). It can be omitted only if the `SCHEDULES_DB_HOST`, `JOBS_DB_HOST` and `EXEC_DB_HOSTS` are provided
- `DOCKER_STORAGE_SECRET`: the name of the secret that contains the Benchsuite Storage configuration (used to store results of the tests)

The optional parameters (or the ones that have a default value) are:

- `SCHEDULES_SYNC_INTERVAL` (default: 60): it the number of seconds between two refresh of the schedules in the MongoDB collection
- `SCHEDULES_JOBS_PRINT_INTERVAL` (default: 60): interval time in seconds to print on the console a report of the scheduled and running jobs
- `DB_NAME` (default: "benchmarking"): the name of the MongoDB database to use
- `SCHEDULES_DB_HOST`: if set, overrides the `DB_HOST` value for the MongoDB instance used to load the schedules
- `SCHEDULES_DB_NAME`: if set, overrides the `DB_NAME` value for the database used to load the schedules
- `SCHEDULES_DB_COLLECTION` (default: "scheduling"): the name of the collection that contains the schedules
- `JOBS_DB_HOST`: if set, overrides the `DB_HOST` value for the MongoDB instance used to store the internal state of the scheduler
- `JOBS_DB_NAME`: if set, overrides the `DB_NAME` value for the database used to store the internal state of the scheduler
- `JOBS_DB_COLLECTION` (default: "_apjobs"): the name of the collection that contains the internal state of the scheduler
- `EXEC_DB_HOST`: if set, overrides the ‘‘DB_HOST‘ value for the MongoDB instance used to log the executions
- `EXEC_DB_NAME`: if set, overrides the `DB_NAME` value for the database used to log the executions

- EXEC_DB_COLLECTION (default: "_apexec"): the name of the collection that contains the logs of the executions
- DOCKER_HOST (default: "localhost:2375"): the host and port of the Docker Swarm instance (used to create containers though the Docker API)
- DOCKER_BENCHSUITE_IMAGE (default: "benchsuite/benchsuite-multiexec"): the name of the benchsuite-multiexec image to use
- DOCKER_GLOBAL_ENV: a comma separated list of environment variables that will be set in the benchsuite-multiexec container (e.g. "VAR1=val1,var_2=val2"). Useful to set the an http proxy if necessary. Use ',' to insert a comma in the variables names or values.
- DOCKER_GLOBAL_TAGS: a comma separated list of string that will be set as tags in the benchmarking results (e.g. "test1,scheduled,automatic")
- DOCKER_ADDITIONAL_OPTS: a string that allows to specify additional command line options that will be appended to the benchsuite-multiexec container command (e.g. "-vvv –failonerror")

2.8.3 Benchsuite Scheduler Docker image

The simplest way to run the Benchsuite Scheduler is to run the `benchsuite/benchsuite-scheduler` Docker image specifying the configuration parameters as envrionment variables:

```
docker run -e DB_HOST=mongodb://172.17.0.1:27017/ -e DOCKER_STORAGE_SECRET=storage -e␣
↪DOCKER_HOST=172.17.0.1:2375 benchsuite/benchsuite-scheduler
```

Alternatively, the configuration can be specified in the `/tmp/config` file.

```
docker run -v /home/mypc/scheduler.conf:/tmp/config benchsuite/benchsuite-scheduler
```

The two approaches can be also be mixed.

2.9 API Reference

class benchsuite.core.controller.**BenchmarkingController**(*config_folder=None*, *storage_config_file=None*)

class benchsuite.core.model.benchmark.**Benchmark**(*tool_id*, *workload_id*, *tool_name*, *workload_name*, *workload_description*)

A Benchmark

2.10 Changelog

This Changelog reports the main changes occuring in the Benchmarking Suite. The versions of the Benchmarking Suite (also called Milestones) refers to the versions of the Docker containers and the Documentation, while the versions of the single modules are reported in each entry of the changelog.

The *Unreleased* section contains changes already released in the Python modules, but not yet included in any Milestone.

2.10.1 Unreleased

- TODO: [stdlib] support creation of keypairs
- TODO: [scheduler] add config parameter to choose whether log successful executions or not

2.10.2 Benchmarking Suite v. 2.5.0

Release date: 2017-12-18

- [backends-2.3.0] MongoDB - storing start time as date object (previously it was a timestamp)
- [scheduler-1.2.0] Support for using Docker unix socket instead of the tcp port
- [core-2.3.1] Fixed DEFAULT section not read in the Json configuration files
- [stdlib-2.4.1] Fixed serialization issue of the LibcloudComputeProvider objects
- [cli-2.1.2] Improvements and fixes to the "shell" command

2.10.3 Benchmarking Suite v. 2.4.0

Release date: 2017-12-04

- [stdlib-2.4.0] randomize names of VMs created by the Benchmarking Suite
- [stdlib-2.4.0] set security groups in openstack
- [scheduler-1.1.0] add config parameter to add global env, tags and additional params
- [scheduler-1.1.0] added the "active" parameter in the schedules
- [core-2.3.0, backends-2.2.0] added storage of execution errors in the database

2.10.4 Benchmarking Suite v. 2.3.1

Release date: 2017-11-21

- [core-2.2.4] fixed support for the –failonerror parameter from the command line

2.10.5 Benchmarking Suite v. 2.3.0

Release date: 2017-11-20

- [core-2.2.2] considering only providers configuration files with extension .json and .conf
- [core-2.2.3] duration is now considered as a metric
- [stdlib-2.3.0] metrics renamed to make them coherent in different tests
- [stdlib-2.3.0] added multiple workloads in the CFD benchmark
- [cli-2.1.1] added –failonerror for the multiexec command. The option allows to not continue with next test if the current one fails
- [scheduler-1.0.0] first release of the Benchsuite Scheduler

2.10.6 Benchmarking Suite v. 2.2.2

Release date: 2017-10-20

This patch release fixes some minor bugs found in the code:

- fixed creation of new sessions if the provider configuration is in json format
- fixed default error handling in the REST server (now the full exception message - and not only "Internal Server Error" is sent back to the caller)
- fixed parsing of "network" and "security_group" parameters: now they can be either the id or the name of the object
- fixed crash of some Filebench workloads on Amazon EC2 using the micro instances

2.10.7 Benchmarking Suite v. 2.2.1

Release date: 2017-10-18

This patch release fixes an outdated information in the REST server documentation page

2.10.8 Benchmarking Suite v. 2.2.0

Release date: 2017-10-18

This minor release introduces following improvements:

- support for json configuration files (only for providers and storage at the moment)
- better handling of network configuration parameters in the provider configuration

2.10.9 Benchmarking Suite v. 2.1.0

Release date: 2017-10-13

This minor release introduces some new functionalities and improvement to the tool:

- support for MongoDB backend
- list of available benchmarks and cloud providers (in Cli and REST)
- field "name" in workload sections in configuration files
- return node_id (in case of OpenStack) in the REST calls
- accept provider configuration as string parameter
- add tags to sessions/executions (e.g. for the user-id in the QET)
- provider and storage configurations can be also specified via command line or environment variable
- improvement and tuning of YCSB, Filebench and DaCapo benchmarks

2.10.10 Benchmarking Suite v. 2.0.0

Release date: 2017-08-01

This is a major release version of the Benchmarking Suite that introduces several changes and improvements with respect to the Benchmarking Suite 1.x versions.

In the Core library:

- a complete refactoring of the code to improve the parameterization and modularization
- introduction of benchmarking sessions

In the StdLib library:

- **for Benchmarks:**
  - NEW CFD Benchmark
  - Updated Filebench and YCSB tools versions
- **for Cloud Providers:**
  - NEW FIWARE FILAB connector
  - Updated Amazon EC2 to work with VPCs

The Cli and REST modules are completely new and the previous implmentation have been abandoned.

2.11 Development

This section explains the development, integration and distritbuion process of the Benchmarking Suite. Intended readers are developers.

2.11.1 Continuous Integration

TBD

2.11.2 Release Steps

Checklist to release the Benchmarking Suite

1. Commit any not-committed file on the workspace
2. Identify whcih modules needs to be released (see commits since the latest release, see the changelog)
3. Update the changelog file if not done (use messages in the commits as reference)

Modules Release

For each module to release:

1. increase the version number in the `__init__py` file
2. create the source distribution package and upload on PYPI Testing (remove the `-r pypitest` to upload on the official PYPI)

```
python setup.py sdist upload -r pypitest
```

3. to test the release from PYPI test:

```
# create a new virtual env
virtualenv -p /usr/bin/python3.5 venvXX

# activate the virtualenv
source venvXX/bin/activate


# install the modules to test
pip install -v -i https://testpypi.python.org/pypi --extra-index-url https://pypi.
↪python.org/simple/ -U benchsuite.core
```

4. upload the distribution packages on PYPI

```
python setup.py sdist upload
```

3. commit and push everything on GitHub
4. create a release on GitHub (this will also create a tag)

Milestone Release

1. Check all the modules and the versions that will be included. Release modules if necessary

1. In `benchsuite-docs`, update the version in conf.py
2. Update the changelog.rst with the changelog for this milestone

6. Commit the documentation on GitHub and create a tag. This will also create a new tag in readthedocs
7. Update the ".release" Dockerfiles in benchsuite-docker project
8. Commit benchsuite-docker and create a new tag. This will trigger the creation of a new tag for docker images

2.11.3 Documentation

Documentation is automatically built on ReadTheDocs at every commit

2.11.4 Docker

Docker containers are built automatically from Dockerfiles located in the benchsuite-docker repository.

To create a new tag of Docker images, create a tag in the Git repository that starts with "v" (e.g. "v2.0", "v1.2.3", "v1.2.3-beta1", . . .)

2.12 FAQs

2.12.1 How to clear all stored benchmarking sessions?

Sessions are stored in a file in `~/.local/share/benchmarking-suite/sessions.dat`. Deleting that file, all sessions will be removed. This should be an extreme solution, the more correct way to delete a session is to use the

destroy-session command.

2.12.2 How to clear all stored executions?

Executions are stored along with the sessions. See previous question: *How to clear all stored benchmarking sessions?*.

CHAPTER 3

Contacts

Main contact person for the Benchmarking Suite is:

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For bugs, features and other code-related requests the issue tracker can be used at: https://github.com/benchmarking-suite/benchsuite-core/issues

CHAPTER 4

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