Improvements Towards the Release of the Pavilion 2.0 Test Harness

Kody J. Everson
Dakota State University
Kody.Everson@trojans.dsu.edu

Francine Lapid
Los Alamos National Laboratory
Lapid@lanl.gov

Mentors (HPC-ENV PRE-team): Paul Ferrell, Nicholas Sly, and Jennifer Green

Overview

High performance computing production support entails thorough testing in order to evaluate the efficacy of a system for production-grade workloads. There are various phases of a system's life-cycle to assess, requiring different methods to accomplish effective evaluation of performance and correctness. Due to the unique and distributed nature of an HPC system, the necessity for sophisticated tools to automatically harness and assess test results, all while interacting with schedulers and programming environment software, requires a customizable, extensible, and lightweight system to manage concurrent testing.

Pavilion Usage and Underlying Process

How to use Pavilion
Step 1: Write a test (specify build, run, scheduler, results, etc. specifications)
Step 2: Run test(s) or suite(s) (optional: view status)
Step 3: Get result, debug as needed

```
hello_world.yaml

hello_world:
  run:
    cmds:
      - 'echo hello'
```

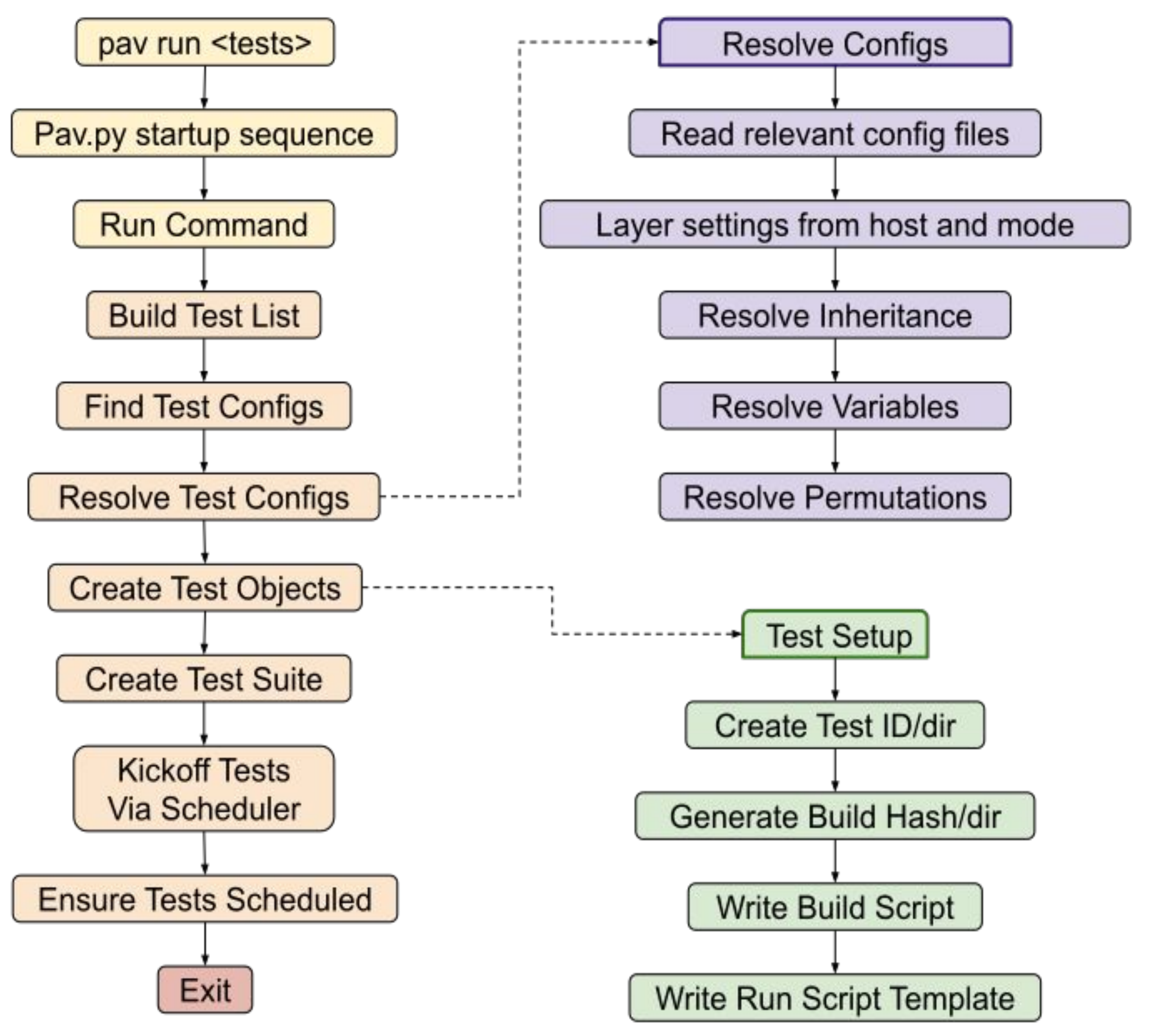
A simple test config

```
bash $ pav run hello_world
Running 1 test in series s154.
  id  |   name      | status     | note
------------------------------------------
 154  | hello_world | SCHEDULED |

bash $ pav result
  id  |   name      | result
----------------------------
 154  | hello_world | PASS
```

Output of `pav run` and `pav result`

Pavilion 2.0 Run Command and Test Setup



Commands

Commands are one way to add functionality to Pavilion and are the main way users interact with the system. The plugin system makes it simple for users to add their own commands, or overwrite existing ones, according to their preferences and machine specifics. We added the following commands:

- `log` - outputs the log file (build, kickoff, or run) of a given test†
- `cancel` - used to cancel a provided test, group of tests, or test series*
- `clean` - used to wipe out the Pavilion working directory (removes all tests, series, downloads, and build directories)*
- `status --all` - prints the last few tests run by a user†
- `run --status` - prints the status of the jobs started with the run command*

```
-bash-4.2$ pav status --all --limit 4
 Test statuses
---------+--------+----------------+--------------------------------+----------------
 Test id | Name   | State          | Time                           | Note
---------+--------+----------------+--------------------------------+----------------
 472     | stream | RESULTS_ERROR | 15 Jul 2019 10:06:38 UTC-06:00 | The test...
 473     | stream | COMPLETE       | 18 Jul 2019 10:09:48 UTC-06:00 | The test...
 474     | stream | RESULTS_ERROR | 18 Jul 2019 10:10:50 UTC-06:00 | The test...
 475     | stream | COMPLETE       | 18 Jul 2019 10:14:48 UTC-06:00 | The test...
```

Output of `status --all` command

```
bash $ pav log run 154
hello

bash $ pav log kickoff 154
The kickoff log is empty.

bash $ pav log build 154
The build log is empty.
```

Output of `log` command

```
bash $ pav clean -v
Removing Tests...
Removed test 0000001
Removed test 0000002
Skipped test 0000003
Skipped test 0000004
Removing Series...
Removed series 0000001
Removed series 0000002
Skipped series 0000003
Removing Downloads...
Removing Builds...
Removed build 58d90e966a0976e2
Removed build c306e89258705bb1
Skipped build 4fe2db5550009a8f
```

Output of `clean` command

```
bash $ pav cancel 21 22 s22 s23
test 21 cancelled.
test 22 could not be cancelled has state: SCHED_CANCELLED.
test 24 cancelled.
test 25 cancelled.
```

Output of `cancel` command

Result Parsers

Result parsers look at the output of the benchmarks, determine what makes a test "pass", and can extract important data from the test's output.

Result Parser	What it does	Keys needed
Constant†	inserts a given constant into the results	constant
Command†	runs a given command	• cmd • success • success_value • stderr_out
Table†	extracts values from a table and puts the data in a nested dictionary	• row_names • col_names

```
bash $ pav log run 77
Output of Stream test:
-------------------------------------------------------------
Function  Best Rate MB/s  Avg time     Min time     Max time
Copy:          6212.9     0.028593     0.025753     0.032994
Scale:         6000.8     0.029258     0.026663     0.032463
Add:           8469.2     0.031915     0.028338     0.034907
Triad:         8106.8     0.033490     0.029605     0.040039
---------
```

```
stream.yaml
results:
  table:
    row_names: ['Copy', 'Scale', 'Add', 'Triad']
    col_names: ['Best Rate MB/s', 'Avg time', 'Min time', 'Max time']
```

Sample table that can be parsed by the table result parser and the yaml config for it

Tests

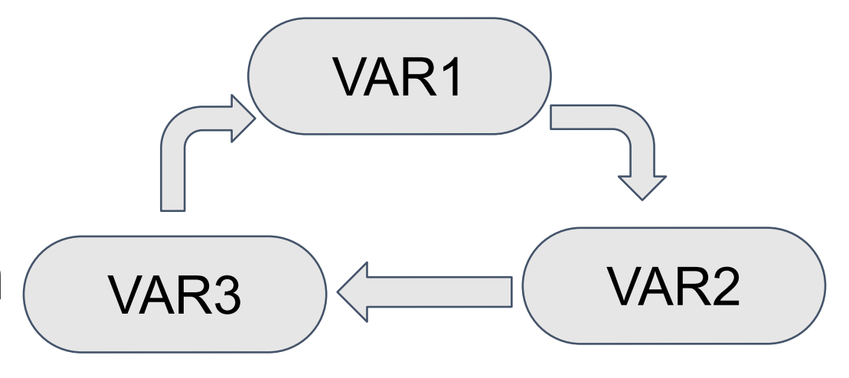
The following tests are already available on the LANL clusters:

hello_mpi	ior*	supermagic	magic_cookies
imb*	license-check	slow_test*	stream†

Other Features

More advanced configuration capabilities:

- Variable-handling
  - Enable variable references in variable values†
  - Handle variable references within permutations†
- Allow users to add commands to their kickoff scripts*, regardless of scheduler



Circular references

Other features:

- For an improved user experience, we designed and implemented an algorithm to automatically wrap output tables*
- Checking for extraneous prints†

Future Work & Acknowledgments

Although some of the contributions we made are still works in progress, we hope to have them completed soon so they can be fully integrated into Pavilion. Additionally, we would like to introduce the following features:

- Slurm chunking - allow users to chunk up slurm jobs, when they realistically cannot get all the nodes required on a certain machine
- Integrate more tests
- Further resolving variables

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*:Everson †: Lapid

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