Pavilion 2.0 - Acceptance Testing

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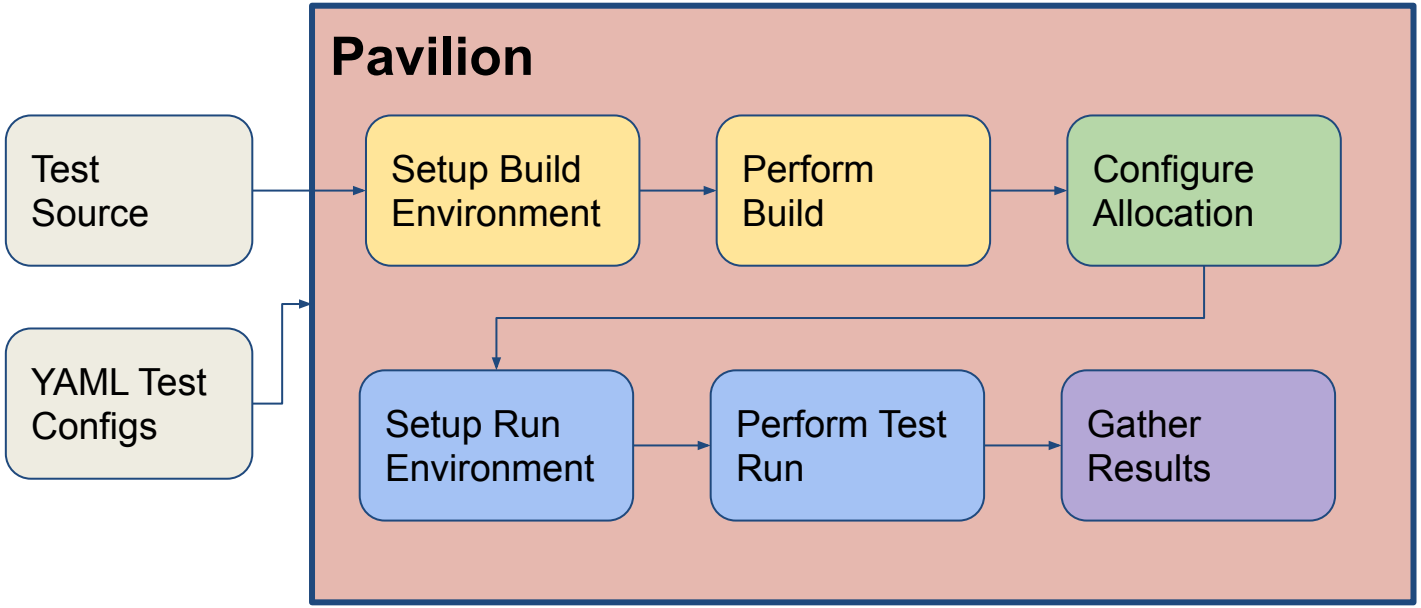
Pavilion Overview



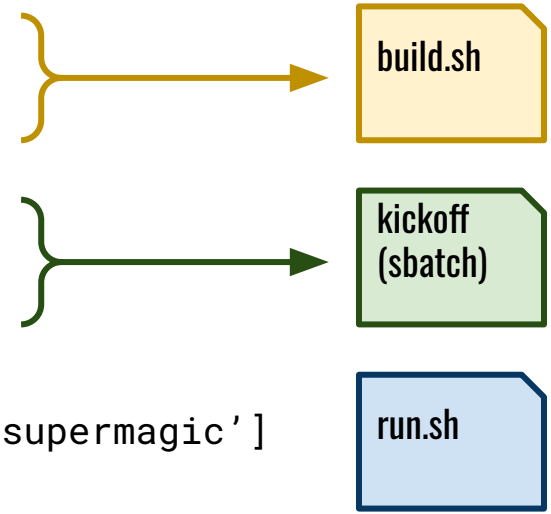
A Test Config (supermagic.yaml)

```
basic:
    build:
        source_path: supermagic.tar.xz
        modules: ['gcc', 'openmpi']
        env: {'CC': 'mpicc'}
        cmds: ['./configure', 'make']

    scheduler: slurm
    schedule:
        nodes: all

    run:
        cmds: ['{{sched.test_cmd}} ./supermagic']

    result_parse:
        regex:
            flops: '^flops: ([0-9]+\.[0-9]+)'
```



Running Tests

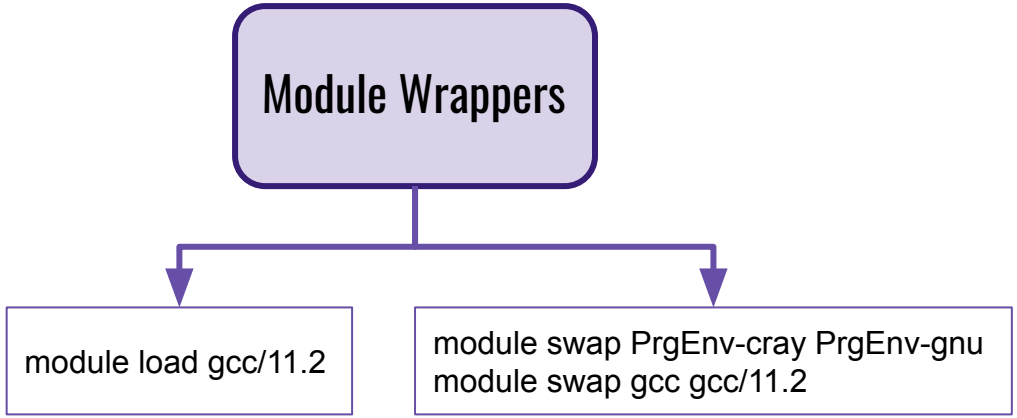
```
fg-rfe1:pflarr $ pav run supermagic
Resolving Test Configs: 100%
Creating Test Runs: 100%
Building 2 tests for test set cmd_line.
BUILD_REUSED: 2
Kicked off '2' tests of test set 'cmd_line' in series 's85'.
```

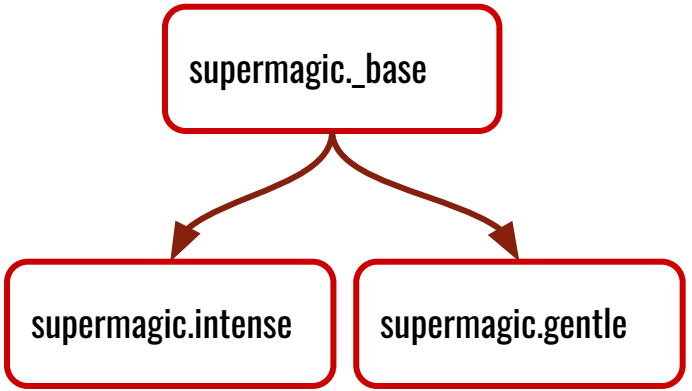
```
fg-rfe1:pflarr $ pav status
 Test statuses
------+----------------+--------------------------+-------+---------------+--------+----------
 Test | Job id         | Name                     | Nodes | State         | Result | Time
------+----------------+--------------------------+-------+---------------+--------+----------
 764  | job_436630_fog | supermagic.base.scratch4 | 27    | RUNNING       |        | 06:47:10
 763  | job_436630_fog | supermagic.base.scratch4 | 27    | COMPLETE      | PASS   | 06:46:30
      |                | -convenience             |       |               |        |
```

Running Tests

```
fg-rfe1:pflarr $ pav results -f 764
[{'created': 1657802750.1974761,
  'duration': 248.88493704795837,
  'finish_date': '2022/07/14 06:50:40',
  'finished': 1657803040.5978634,
  'id': 764,
  'job_info': {'id': '436630', 'sys_name': 'fog'},
  'name': 'supermagic.base.scratch4',
  'pav_result_errors': [],
  'pav_version': '2.4',
  'per_file': {},
  'permute_on': {'scratch_all': None},
  'result': 'PASS',
```

Generic Tests





Tests and Benchmarks

branson
ior
dgemm
hpcg
hpl
pynamic
snap

umt
vpic
minipic
pennant
imb
and more…

VPIC

“VPIC is a general purpose particle-in-cell simulation code for modeling kinetic plasmas in one, two, or three spatial dimensions.”

Build Configuration

```
_base:

  variables:
    vpic_bui
      build_
      integr
      unit_t
      openss
      dynami
      min_nu
      legacy
      v4_por
      v4_sse
      v4_avx
      v4_avx
      v8_por
      v8_avx
      v8_avx
      v16_po
      v16_av
```

```
build:
  source_url: https://github.com/lanl/vpic/archive/refs/heads/master.zip
  source_path: vpic
  source_download: never

  modules: [cmake, '{{compiler}}', '{{mpi}}']

  cmds:
    - mkdir build
    - cd build
    - >
      cmake
      -LAH
      -DCMAKE_BUILD_TYPE={{vpic_build.build_type}}
      -DENABLE_INTEGRATED_TESTS={{vpic_build.integrated_tests}}
      -DENABLE_UNIT_TESTS={{vpic_build.unit_tests}}
      -DENABLE_OPENSSL={{vpic_build.openssl}}
      ...
      -DBUILD_SHARED_LIBS={{vpic_build.shared}}
      -DCMAKE_C_COMPILER=$(which {{vpic_build.cc}})
      -DCMAKE_CXX_COMPILER=$(which {{vpic_build.cxx}})
      ..
    - "make -j {{vpic_build.make_jobs}} VERBOSE={{vpic_build.make_verbose}}"
```

Generating an Input Deck

```
vpic_input?:

  # Average number of particles/ce
  nppc: 1024
  # Number of simulation steps to
  nstep: 1

  # Full topology will be the sing
  # times the multi-node topology
  # Topology size across all nodes
  snodes_x: 1
  snodes_y: 1
  snodes_z: 1
  # Grid size for a single node
  nranks_x: 5
  nranks_y: 5
  nranks_z: 5

  # Nodes needed to run this topology.
  nnodes: '{{snodes_x * snodes_y * snodes_z}}'
  # Ranks per node needed for this topology.
  nranks: '{{nranks_x * nranks_y * nranks_z}}'

  # Whether or not to push ions
  mobile_ions: 1
```

```
// Average number of particles/cell in ea. species
double nppc                = {{vpic_input.nppc}};
// Flag to turn on/off particle load
int load_particles         = 1;
// Whether or not to push ions
int mobile_ions            = {{vpic_input.mobile_ions}};

int He_p
int H_pr
```

```
run:
  templates:
    'vpic/lpi-input.tmpl.cxx': 'lpi-input.cxx'

  cmds:
    - ./build/bin/vpic {{vpic_input_deck}}
    - '{{sched.test_cmd}} lpi-input.Linux'

schedule:
  nodes: '{{vpic_input.nnodes}}'
  tasks_per_node: '{{vpic_input.nranks}}'
```

Test Cases

```
_cases_136_30_28:
  inherits_from: _base
  variables:
    vpic_input:
      nx_sn: 136
      ny_sn: 30
      nz_sn: 28
```

```
cases_136_30_28:
  inherits_from: _cases_136_30_28
  permute_on: vpic_input
  subtitle: '{{vpic_input.nranks_x}}-{{vpic_input.nranks_y}}'
            '-{{vpic_input.nranks_z}}'
  variables:
    vpic_input:
      - {nranks_x: 1,   nranks_y: 1,   nranks_z: 1}
      - {nranks_x: 2,   nranks_y: 1,   nranks_z: 1}
      - {nranks_x: 4,   nranks_y: 1,   nranks_z: 1}
      - {nranks_x: 8,   nranks_y: 1,   nranks_z: 1}
      - {nranks_x: 8,   nranks_y: 2,   nranks_z: 1}
      - {nranks_x: 17,  nranks_y: 1,   nranks_z: 1}
      - {nranks_x: 4,   nranks_y: 5,   nranks_z: 1}
      - {nranks_x: 8,   nranks_y: 2,   nranks_z: 2}
      - {nranks_x: 17,  nranks_y: 2,   nranks_z: 1}
      - {nranks_x: 4,   nranks_y: 5,   nranks_z: 2}
      - {nranks_x: 8,   nranks_y: 3,   nranks_z: 2}
      - {nranks_x: 4,   nranks_y: 2,   nranks_z: 7}
      - {nranks_x: 8,   nranks_y: 2,   nranks_z: 4}
      - {nranks_x: 17,  nranks_y: 2,   nranks_z: 2}
      - {nranks_x: 8,   nranks_y: 5,   nranks_z: 2}
      - {nranks_x: 8,   nranks_y: 3,   nranks_z: 4}
      - {nranks_x: 8,   nranks_y: 2,   nranks_z: 7}
      - {nranks_x: 17,  nranks_y: 2,   nranks_z: 4}
      - {nranks_x: 8,   nranks_y: 5,   nranks_z: 4}
      - {nranks_x: 8,   nranks_y: 2,   nranks_z: 14}
      - {nranks_x: 34,  nranks_y: 2,   nranks_z: 4}
```

Acceptance Testing: A True Story

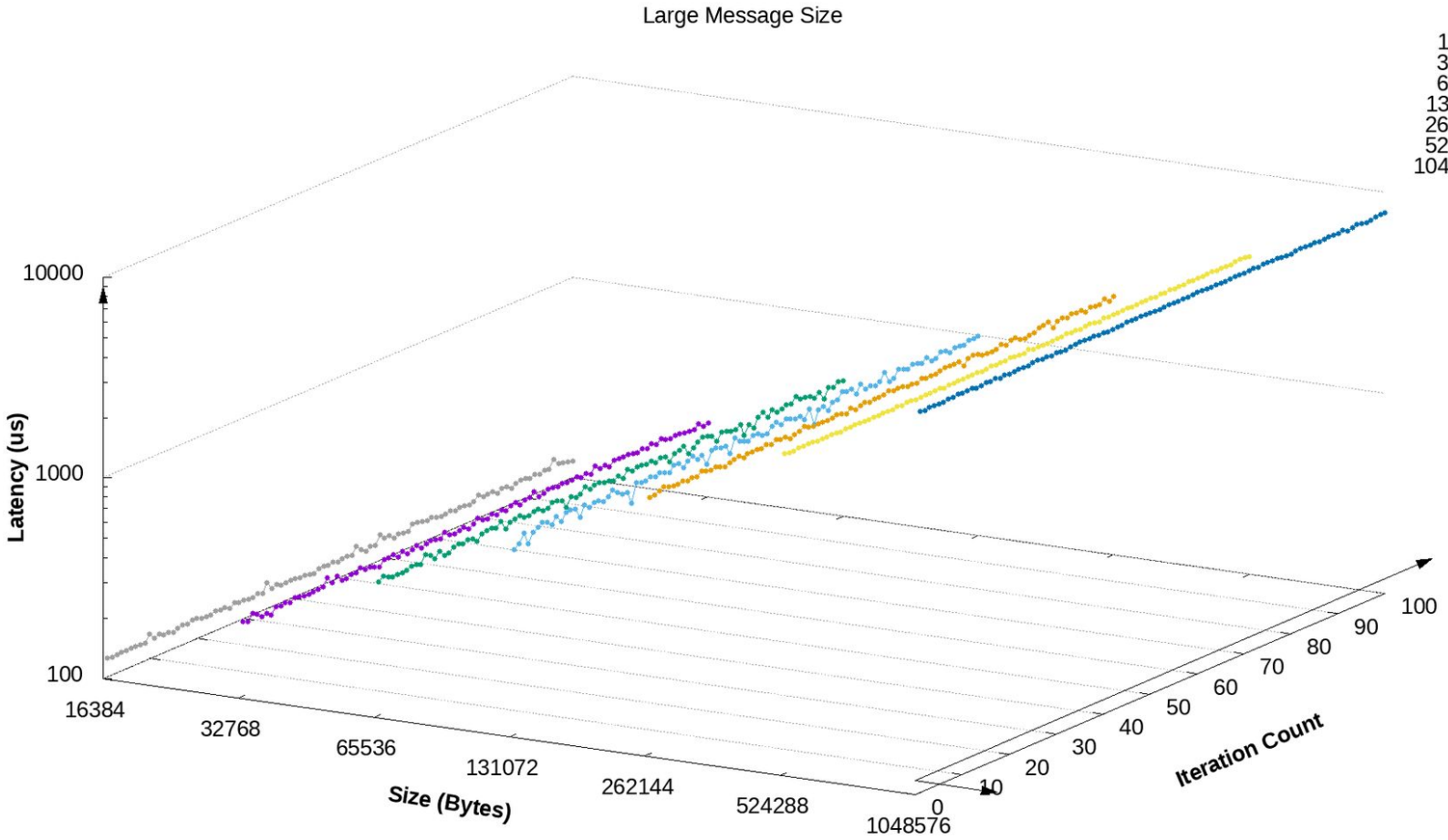
OSU Benchmarks (All to All)

```
pav run osu.all-to-all
```

hangs

```
pav log run 47912
```

Size	Latency
1	0.6 us
4	2.5 us
16	10 us
256	…


Large Message Size
16384
32768
65536
131072
262144
524288
1048576
Latency (us)
10000
1000
100
16384
32768
65536
131072
262144
524288
1048576
Size (Bytes)
0
10
20
30
40
50
60
70
80
90
100
Iteration Count

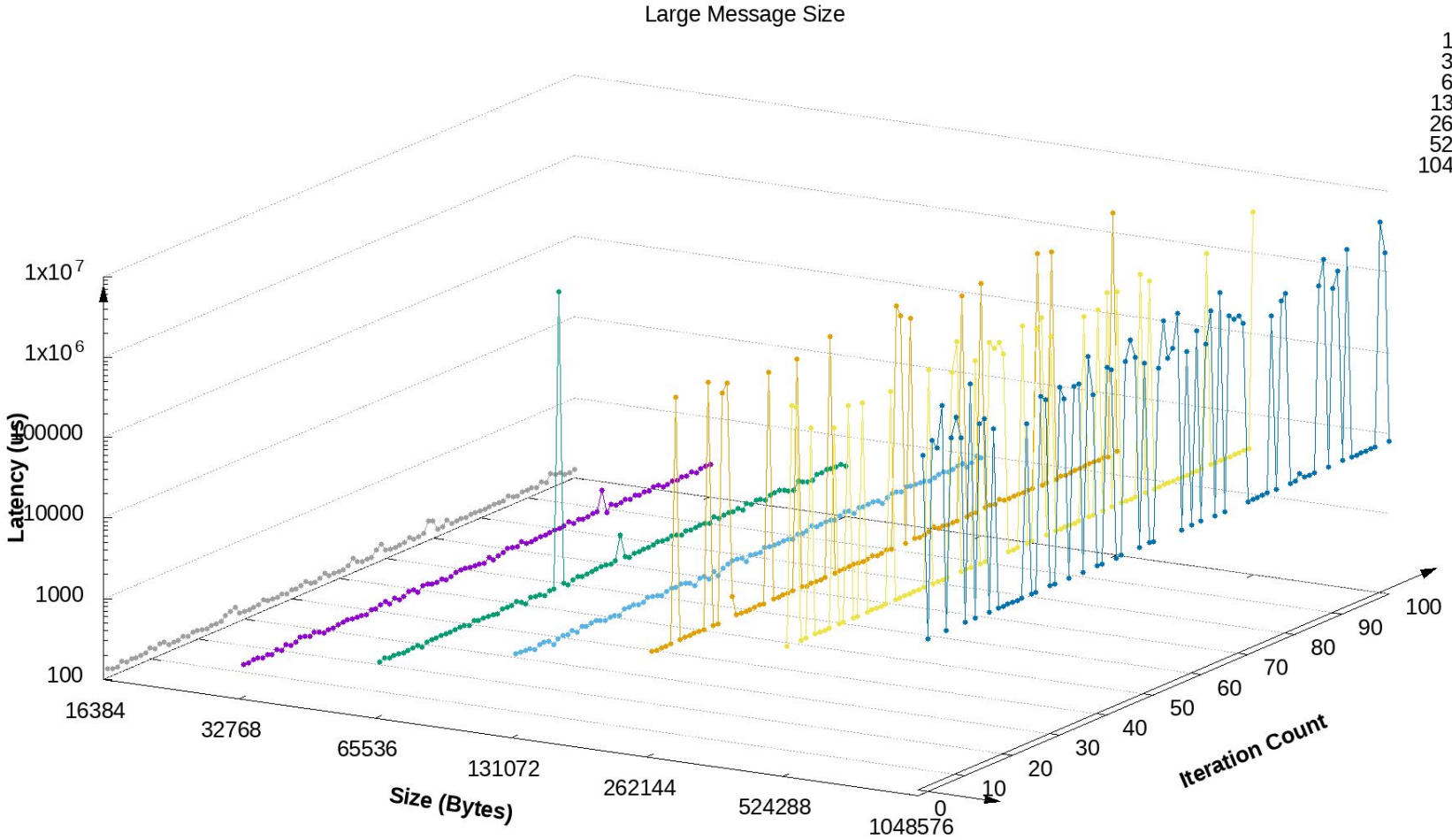
OSU Benchmarks (All to All)

```
pav run -c schedule.chunking.size=64
        -c permute_on='sched.chunk_id'
        osu.all-to-all
```

OSU Benchmarks (All to All)

```
pav run -c schedule.chunking.size=16
        -c permute_on='sched.chunk_id'
        osu.all-to-all
```

Size	Latency
1	0.6 us
4	2.5 us
16	10 us
256	18234 us
512	123418 us


Large Message Size
16384
32768
65536
131072
262144
524288
1048576
Latency (µs)
1x10^7
1x10^6
100000
10000
1000
100
16384
32768
65536
131072
262144
524288
1048576
Size (Bytes)
0
10
20
30
40
50
60
70
80
90
100
Iteration Count

The Moral Is…

- I don’t know much about OSU benchmarks.
- Anyone from our team could have done this.

Getting Pavilion

Source:
https://www.github.com/hpc/pavilion2

Documentation:
https://pavilion2.readthedocs.io

Contact:
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