TEXAS ADVANCED COMPUTING CENTER

WWW.TACC.UTEXAS.EDU

The University of Texas at Austin

BenchPRO

An automation and standardization utility for compiling applications, running benchmarks and collecting results

PRESENTED BY:

Matthew Cawood

Objectives

- Automate building applications, running benchmarks and storing result data
- Provide framework to standardize workflows and improve reproducibility
- Support different testing/investigations strategies
- Automatically capture provenance data for future reference
- Provide an interface for exploring and comparing results

Overview

CLI interface
System Python package
Users load Python & BenchPRO module

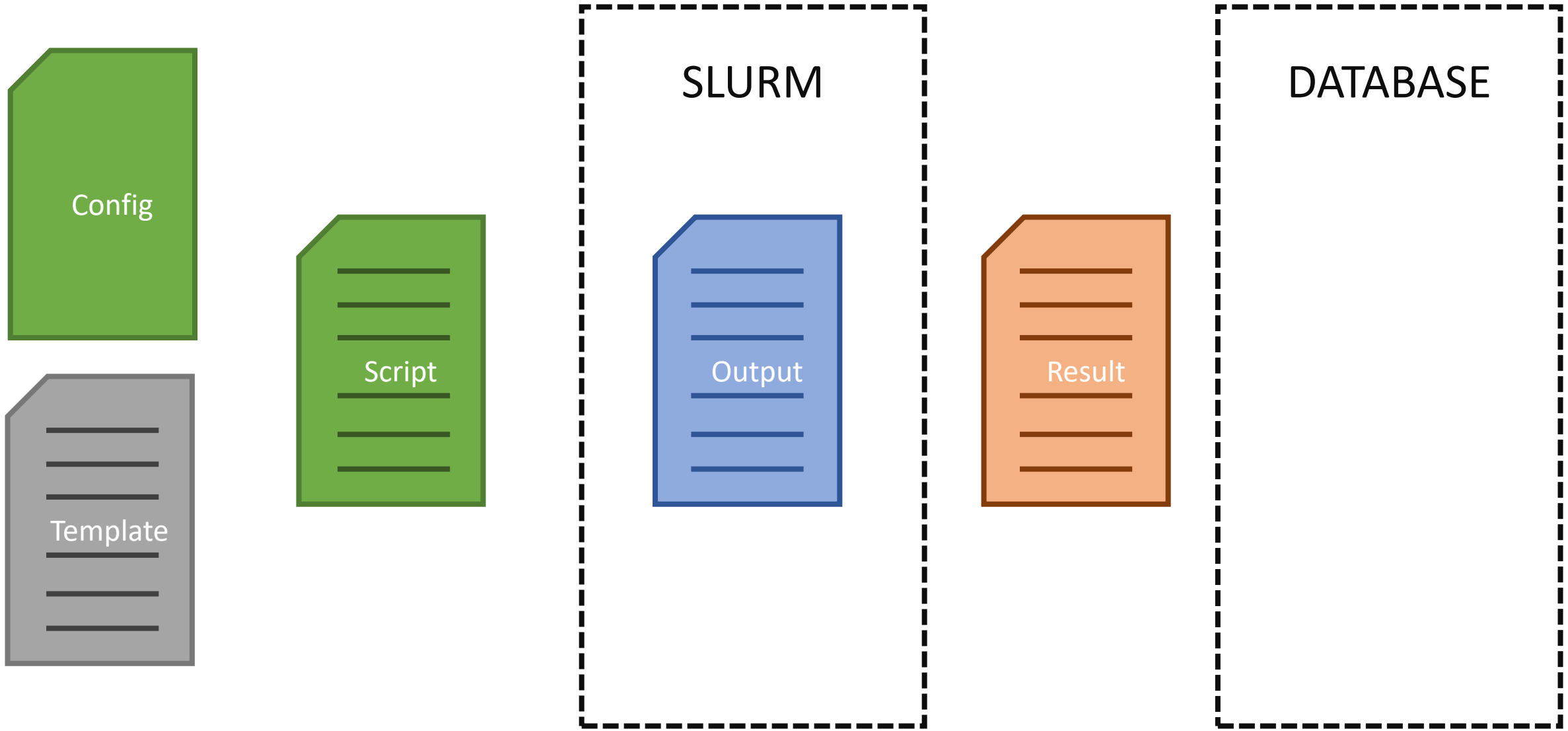
Dependencies:

- SLURM
- Lmod

One job = one result

How it works

1. Compile an application
2. Run a benchmark
3. Store the result


Config
Template
Script
SLURM
Output
Result
DATABASE

How it works

Applications are differentiated by a unique combination of:

Identifier	Example
Code	WRF
Version	4.2
Build label	AVX2
System	Frontera
Architecture	Cascadelake
Compiler	intel/19.1.1
MPI	Impi/19.0.3

Resulting directory:

`…/frontera/cascadelake/intel19/impi19/wrf/4.2/avx2/`

How it works

Output from completed jobs is processed to extract unit of merit

- Shell commands
- More complex bash/Python script

Valid result along with machine state, and reproducibility files are stored to remote database.

Django based web frontend provides sorting and filtering of results

Reporting

BenchTool

Add new result | View Applications

Username: System: JobID: Submit time: Application: Search

User	System	Job ID	Submit time	Dataset	Nodes / Ranks / Threads / GPUs	
mcawood	frontera		Jan. 26, 2021, 12:11 a.m.	JAC_production_NPT_4fs_AMBER16	1 / 56 / 1 / 0	
mcawood	frontera		Jan. 26, 2021, 12:11 a.m.	JAC_production_NVE_4fs_AMBER16	1 / 56 / 1 / 0	
mcawood	frontera		Jan. 26, 2021, 12:49 a.m.	ljmelt	1 / 56 / 1 / 0	
mcawood	frontera		Jan. 26, 2021, 2:30 a.m.	ljmelt	1 / 4 / 1 / 0	
mcawood	frontera		Jan. 26, 2021, 2:30 a.m.	ljmelt	1 / 8 / 1 / 0	
mcawood	frontera		Jan. 26, 2021, 2:30 a.m.	ljmelt	1 / 16 / 1 / 0	
mcawood	frontera		Jan. 26, 2021, 2:40 a.m.	ljmelt	1 / 4 / 1 / 0	
mcawood	frontera		Jan. 26, 2021, 2:40 a.m.	ljmelt	1 / 8 / 1 / 0	
mcawood	frontera		Jan. 26, 2021, 2:40 a.m.	ljmelt	1 / 16 / 1 / 0	
mcawood	frontera		Jan. 26, 2021, 3:03 a.m.	JAC_production_NVE_4fs	1 / 56 / 1 / 0	132.610 ns/day
mcawood	frontera		Jan. 26, 2021, 3:03 a.m.	FactorIX_production_NVE_4fs	1 / 56 / 1 / 0	32.770 ns/day

Benchmark Result

Delete | TaccStats Report

User	mcawood
System	stampede2
Submission time	May 18, 2021, 12:03 a.m.
Elapsed time	245 seconds
End time	May 18, 2021, 12:07 a.m.
Capture time	May 18, 2021, 12:22 a.m.
Description	
Job ID	7747380 (COMPLETED)
Nodes	1
Job Nodelist	c591-201
Ranks per node	48
Total ranks	48
Threads	1
GPUs	0
Result	216.330 seconds
Resource_URL	mcawood/stampede2/7747380
Application info	

Useful features

- Dry run mode
- Limit max concurrent scheduler jobs
- Local repository
- Parameter overload from CLI
- Automatic optimization flags
- Application modules generated automatically
- Automatic software/hardware data collection
- Support for benchmark parameter arithmetic handling
  - `E.g. work_size = {nodes} \* {ranks_per_node} \* 4`
- Applications & benchmarks can be grouped in ‘suites’
- Multiple benchmarks (series) can be batched
- Local execution mode

Reference Applications

Applications	Synthetics
AMBER20	HPL
LAMMPS	HPCG
MILC	STREAM
OpenFOAM	GPCNET
Quantum Espresso	
SWIFTsim	
WRF	
SpecFEM3D	

Demo

Lmod Integration

- Query system module exists
- Get default module version (long format)
- Create module file during build
- Load BenchPRO module during bench

Main Repo:
https://github.com/TACC/benchpro-site

Database:

https://github.com/TACC/benchdb

Feedback to:

mcawood@tacc.utexas.edu