An Automated Performance Evaluation Framework for the Ginkgo Software Ecosystem
Moving towards Continuous Benchmarking (CB)

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A Healthy Software Development Cycle
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- Version control system for tracking changes and coordinating collaborative development.
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- CI Build system continuously checks the compilation success on different architectures.

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- Goal: Automated benchmark runs every time new code is added.

Continuous Integration (CI)

- Source Code Repository
- CI Build
- CI Test
- CI Benchmark Tests
- Schedule in Batch System
- HPC System
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Security Thrust!
- External code is run on HPC system
- Possible point of attack

Continuous Integration (CI)
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- Source Code Repository
- CI Build
- CI Test
- CI Benchmark Tests
- Schedule in Batch System
- HPC System
- Trusted Reviewer
  - Code Review
  - Merge into Master Branch
- Developers

Continuous Integration (CI)

- Manual code reviews by trusted reviewers who take responsibility for executing code on the HPC system.
A Healthy Software Development Cycle

- Source Code Repository
- CMake
- GoogleTest
- Trusted Reviewer
- Continuous Integration (CI)
- HPC System

- Manual code reviews by trusted reviewers who take responsibility for executing code on the HPC system.
- How to archive the results and make them accessible?
A Healthy Software Development Cycle

- **Source Code Repository**
- **CMake** (Cross-platform Make)
- **CI Build**
- **CI Test**
- **Performance Data Repository**
- **CI Benchmark Tests**
- **Schedule in Batch System**
- **HPC System**
- **Code Review**
- **Merge into Master Branch**

- Store data in separate repository.
- Use JSON data exchange format.

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Users

Developer

Push

- Store data in separate repository.
- Use JSON data exchange format.
- Cloning a huge repository is expensive.
- "Interest in my experiments, only."
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- Cloning a huge repository is expensive.
- “Interest in my experiments, only.”
- Interactive web-based Ginkgo Performance Explorer (GPE).
A Healthy Software Development Cycle

Continuous Integration (CI)

- Source Code Repository
- CMake
- googletest
- git
- Performance Data Repository
- CI Build
- CI Test
- CI Benchmark Tests
- HPC System
- Schedule in Batch System
- Trusted Reviewer
  - Code Review
  - Merge into Master Branch
- Users
  - Web-Application
- Developer
  - Push
- Users
  - Merge into Master Branch
  - Ginkgo Performance Explorer (GPE)
Ginkgo Performance Explorer (GPE)

Data Selection Tab

1. Select Data in Git repository.

Transformation Script Editor

Data and Plot Viewer
Ginkgo Performance Explorer (GPE)

1. Select Data in Git repository.
2. Write JSONata script to visualize data (examples are provided).
Ginkgo Performance Explorer (GPE)

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2. Write JSONata script to visualize data (examples are provided).

3. Analyze data visually.
Ginkgo Performance Explorer (GPE)
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Performance profile on V100_saturn(cuda)

Maximum slowdown factor over fastest
Continuous Benchmarking Benefits

- Archiving performance data along with execution parameters ensures full benchmark reproducibility.
- Comparing the performance results over the code lifetime identifies performance degradations.
- Ease of use: the setup allows to launch benchmark with few clicks.
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Ginkgo Performance Explorer (GPE) Benefits

- The design of GPE efficiently realizes the analysis as web service, removing the need for downloading performance data to local disk or installing additional software.
- External developers without access to HPC systems can test and engineer their codes on HPC resources.
- Extensibility: Option to compare performance with other software libraries.
Learn More about Ginkgo

- Open-source C++ framework for sparse linear algebra.
- Sparse linear solvers, preconditioners, SpMV etc.
- Generic algorithm implementation:
  + reference kernels for checking correctness;
  + architecture-specific highly optimized kernels.
- Focused on GPU accelerators (i.e. NVIDIA GPUs).
- Software quality and sustainability efforts guided by xSDK community policies:
  - open source
  - Doxygen
  - CMake
  - googletest
  - GitLab CI

https://xsdk.info/

https://ginkgo-project.github.io/

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