Performance Results

Chapel Team, Cray Inc.

Chapel version 1.15

April 6, 2017

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Executive Summary

- **Generally speaking, performance has improved with 1.15**
  - in fact, this is our strongest release ever
- **Previous slide decks have shown performance changes:**
  …due to array improvements
  …due to compiler and library optimizations
  …due to runtime optimizations
- **These slides contain additional v1.15 performance results**
  - not tied to any specific effort, just comparisons across releases

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Outline

- Single-Locale Performance Trends
- Multi-Locale Performance Trends

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Single-Locale Performance Trends

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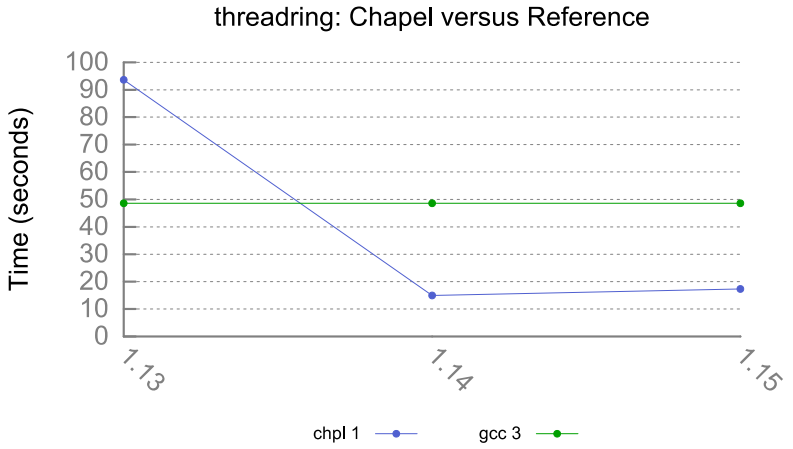
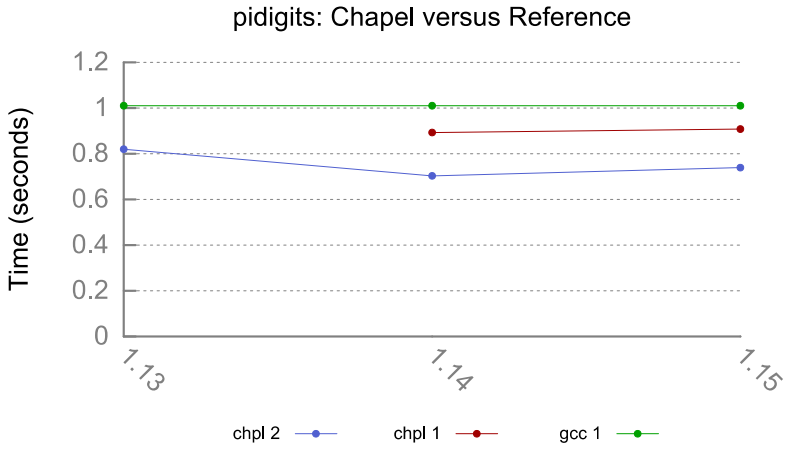
Single-Locale Performance

- **A few expected performance regressions**
  - minor thread-ring regression caused by limiting qthreads pool size
    - change was necessary, no other benchmarks impacted
  - minor pi-digits regression caused by hybrid spin/condwait
    - change had an enormously positive impact overall
    - minor regressions for serial/low-task applications only





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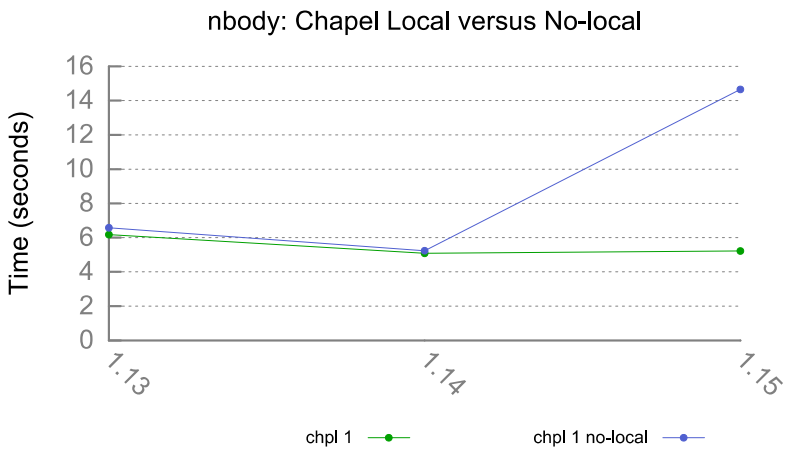
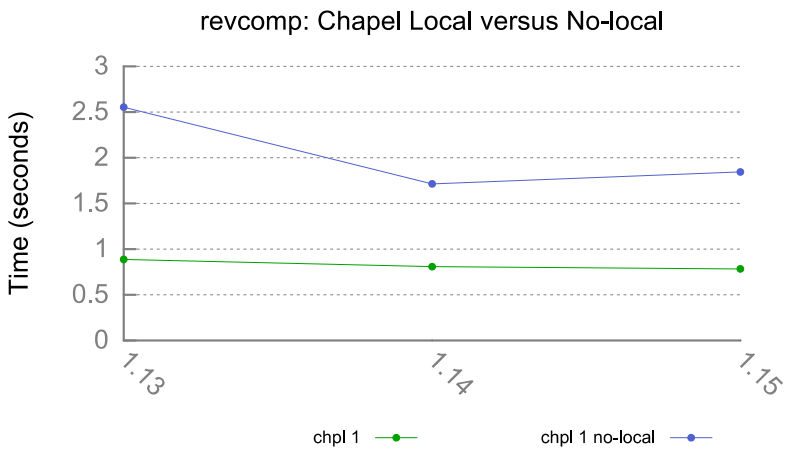
Single-Locale Performance

- **A few surprising --no-local regressions**
  - caused by array memory management improvements
    - slipped by our --no-local perf triage, will track more closely in the future
  - nbody regression has already been resolved
    - investigating fixes for other regressions





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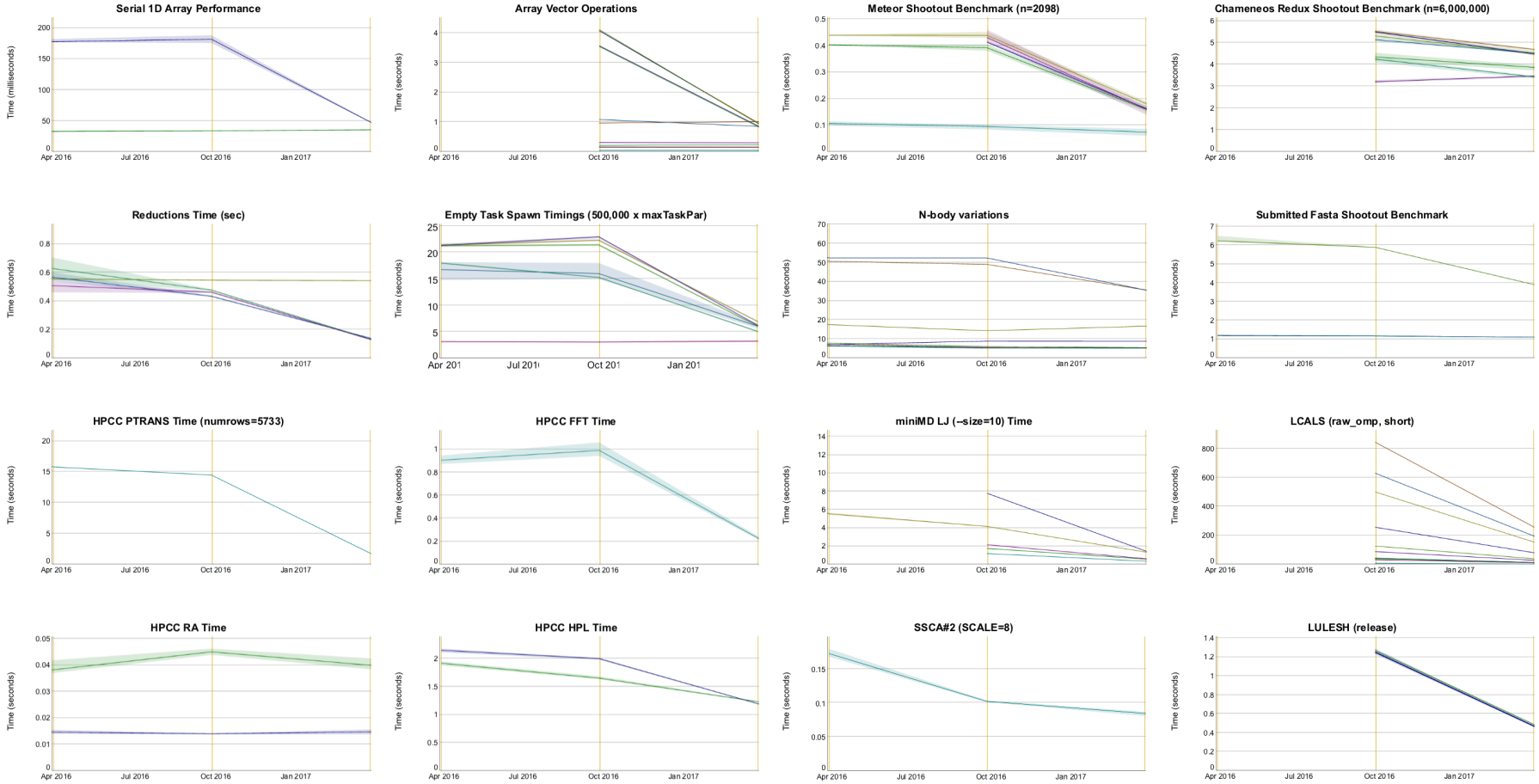
Single-Locale Performance

- Overall, single-locale performance improved dramatically



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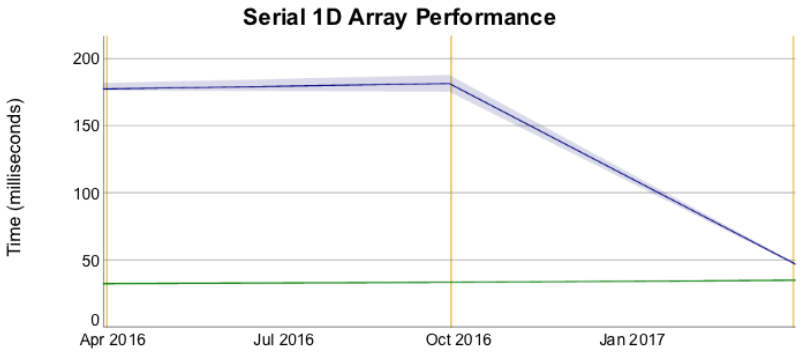
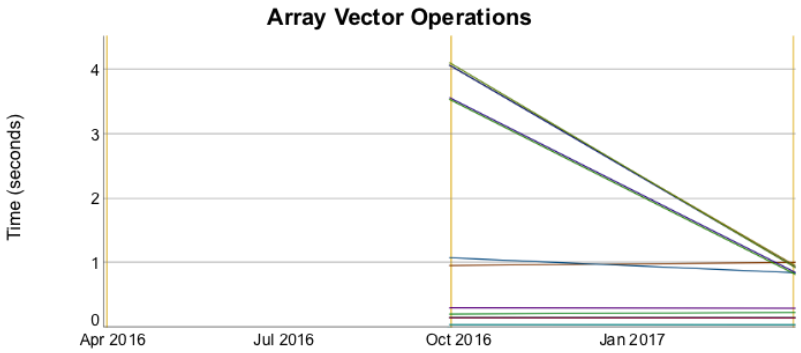
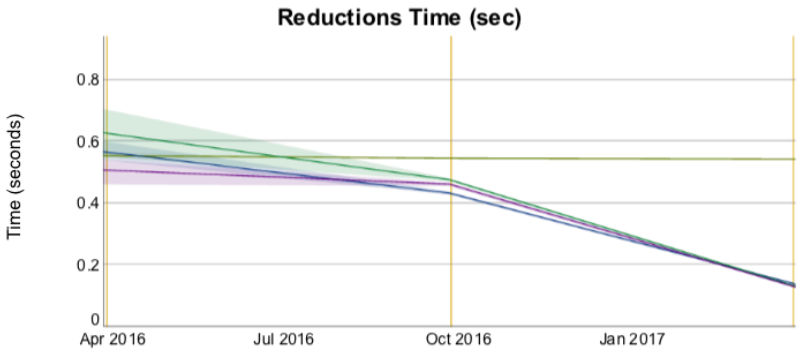
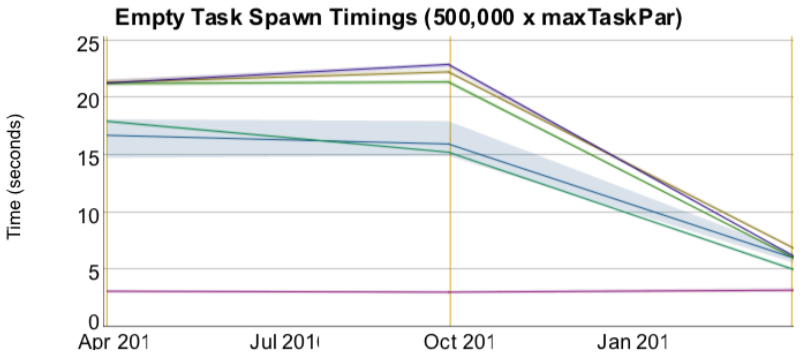
Single-Locale Performance

- **Overall, single-locale performance improved dramatically**
  - speedups for single-idiom micro-benchmarks









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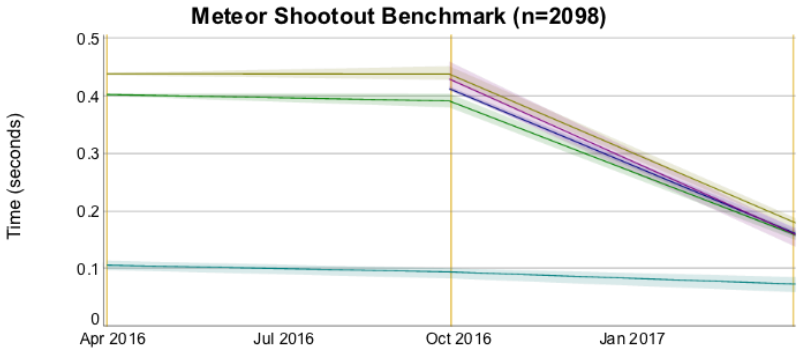
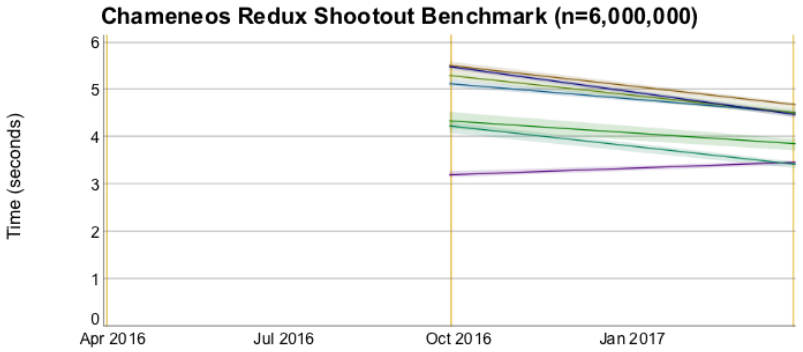
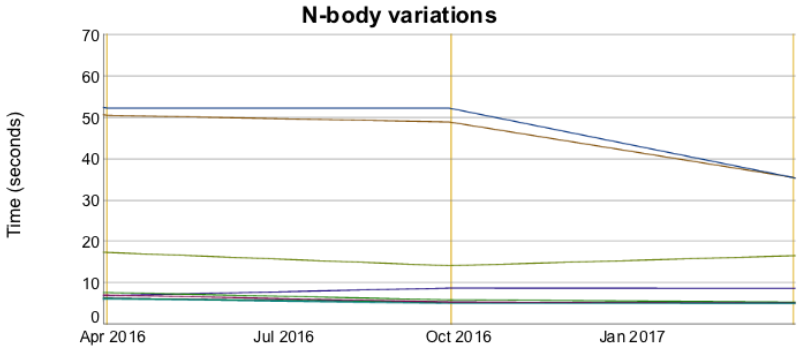
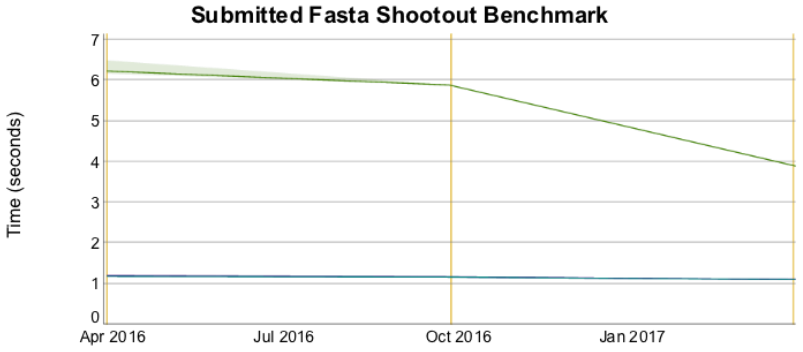
Single-Locale Performance

- **Overall, single-locale performance improved dramatically**
  - improvements for several shootout codes









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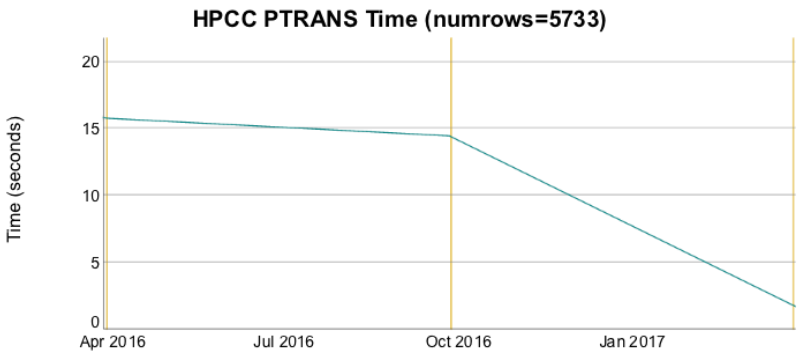
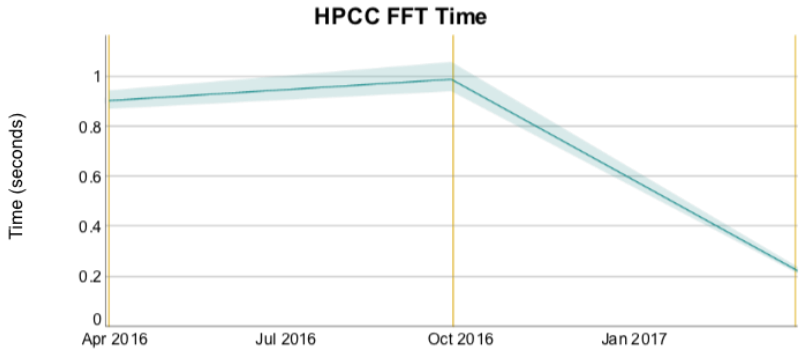
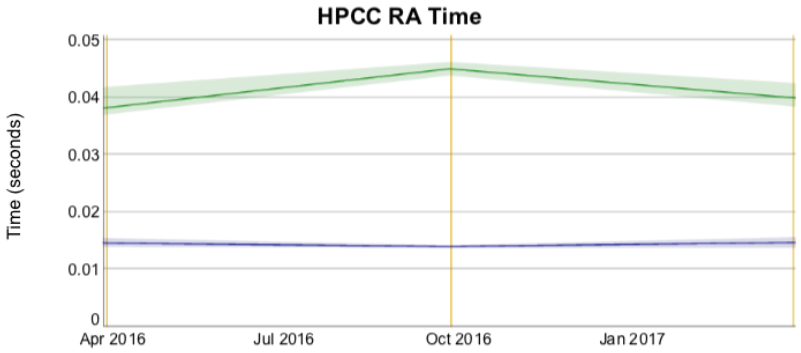
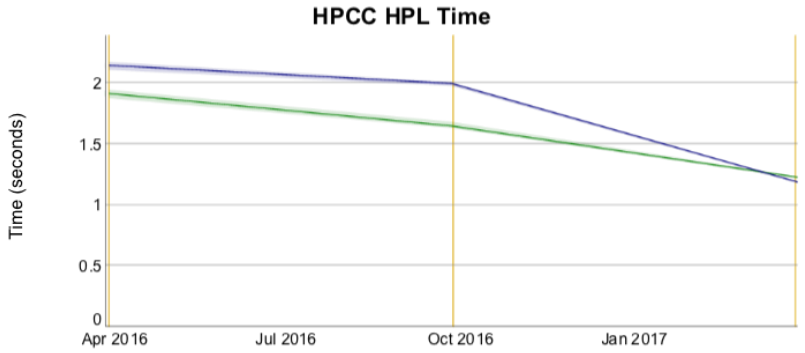
Single-Locale Performance

- **Overall, single-locale performance improved dramatically**
  - substantial speedups for HPCC codes









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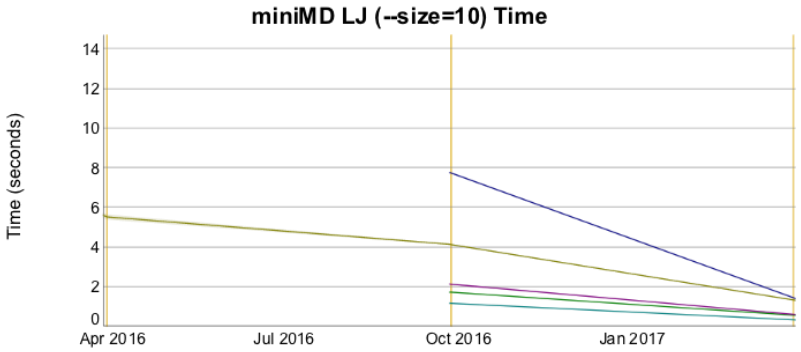
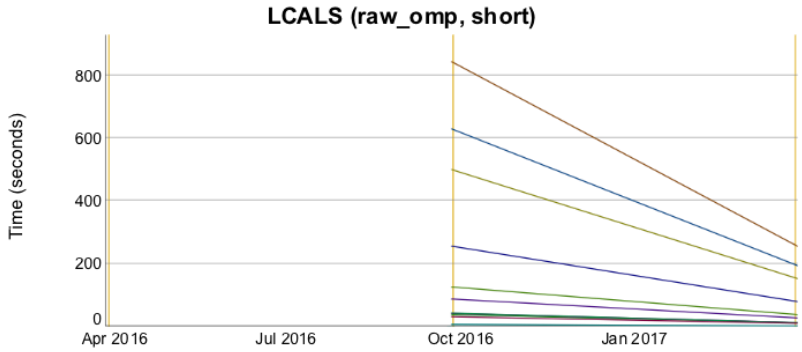
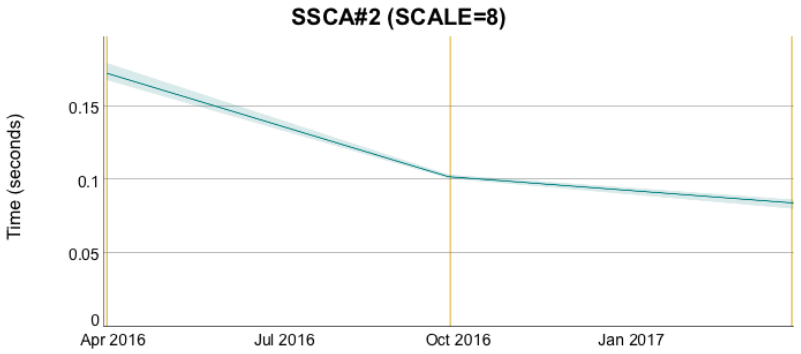
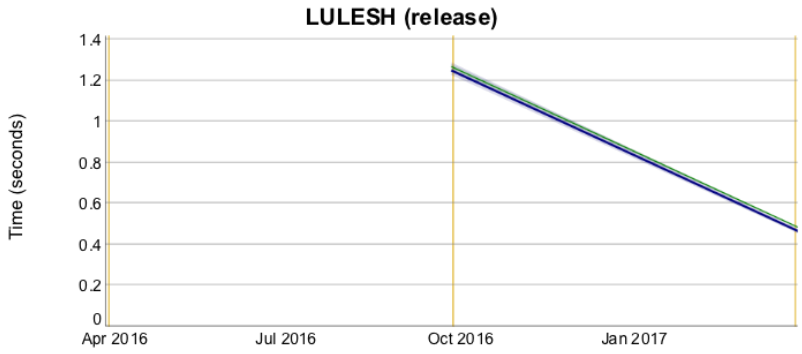
Single-Locale Performance

- **Overall, single-locale performance improved dramatically**
  - huge improvements for core proxy apps









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Multi-Locale Performance Trends

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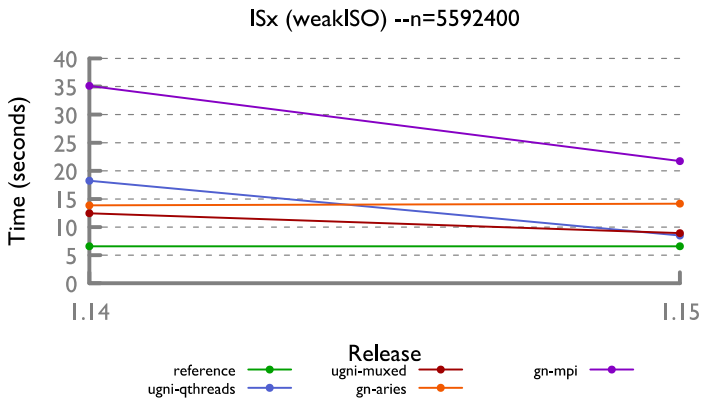
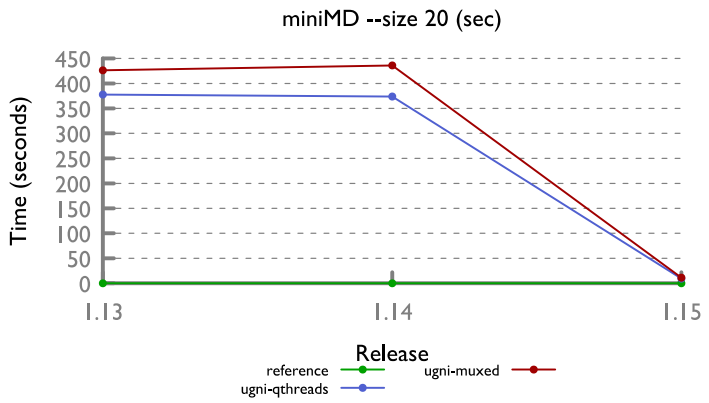
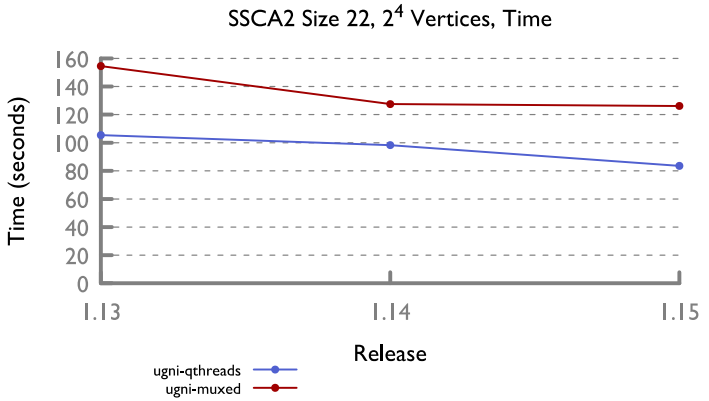
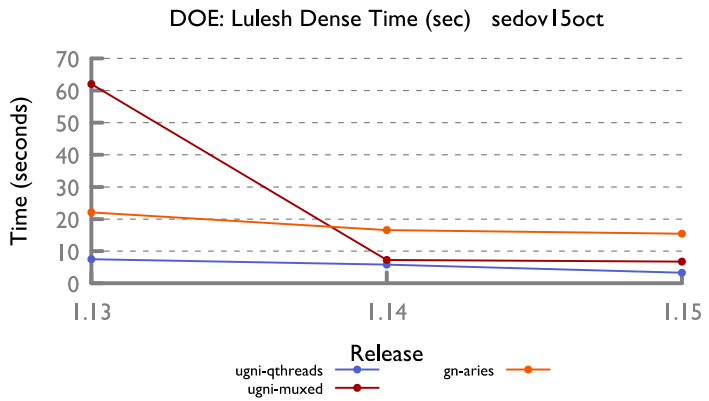
Multi-locale Performance

- **Significant multi-locale performance improvements**
  - no known regressions









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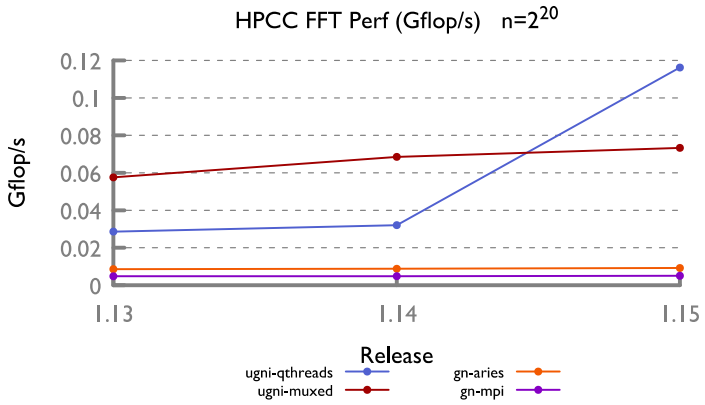
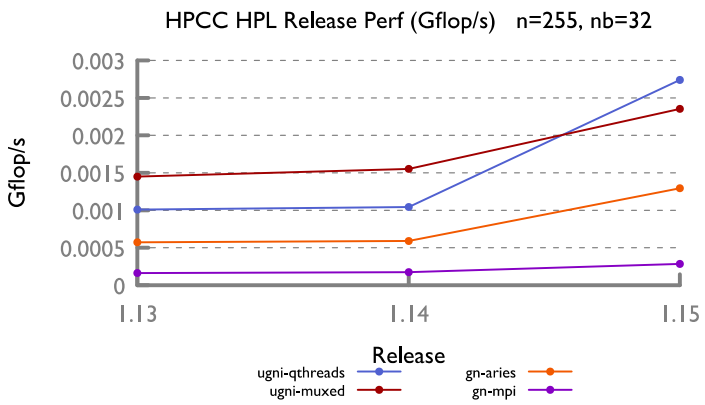
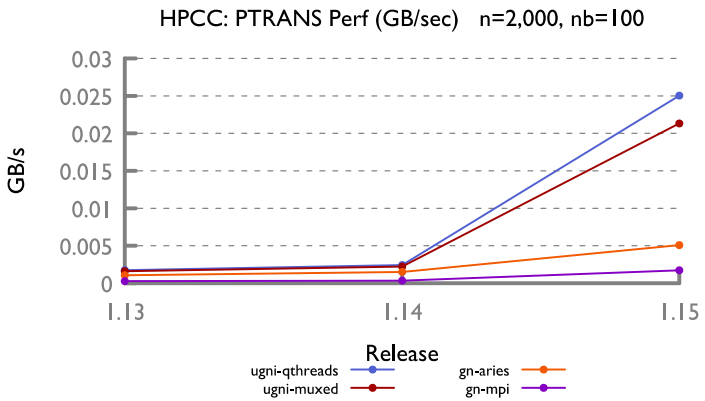
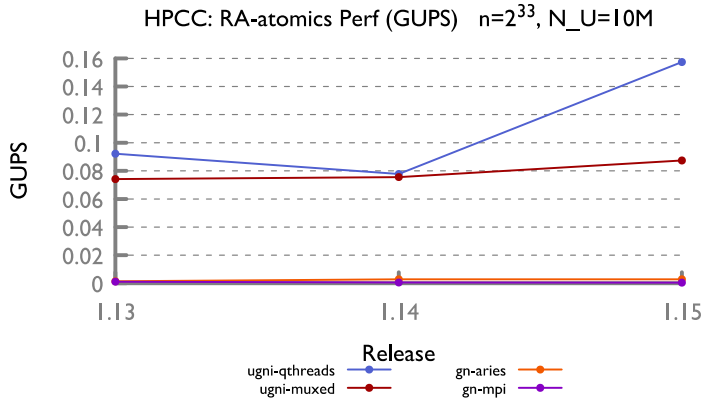
Multi-locale Performance

- **Significant multi-locale performance improvements**
  - no known regressions (qthreads now outperforms muxed even more)









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Performance Priorities and Next Steps

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Performance Priorities and Next Steps

- **Improve NUMA-aware performance**
  - strive to support NUMA by default without performance loss
- **Continue benchmark-driven improvements**
  - single-locale:
    - eliminate remaining performance gap for LCALS
    - improve performance for shootouts and proxy apps
  - multi-locale:
    - reduce unnecessary communication code
    - optimize scalability of core algorithms (task spawning, reductions, barriers)
    - focus on ISx, MiniMD/CoMD, LULESH

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