MPI-based data reduction in Mantid

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European Spallation Source

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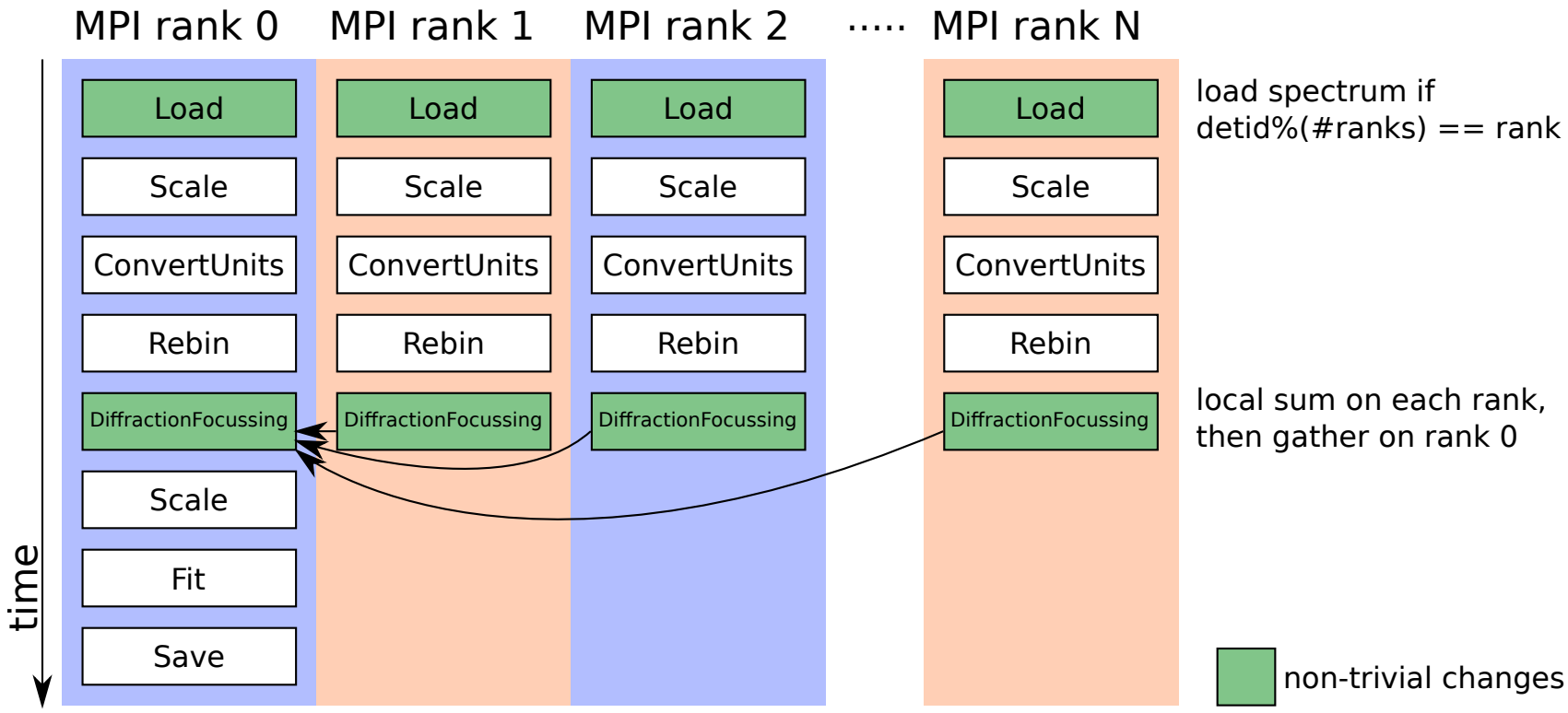
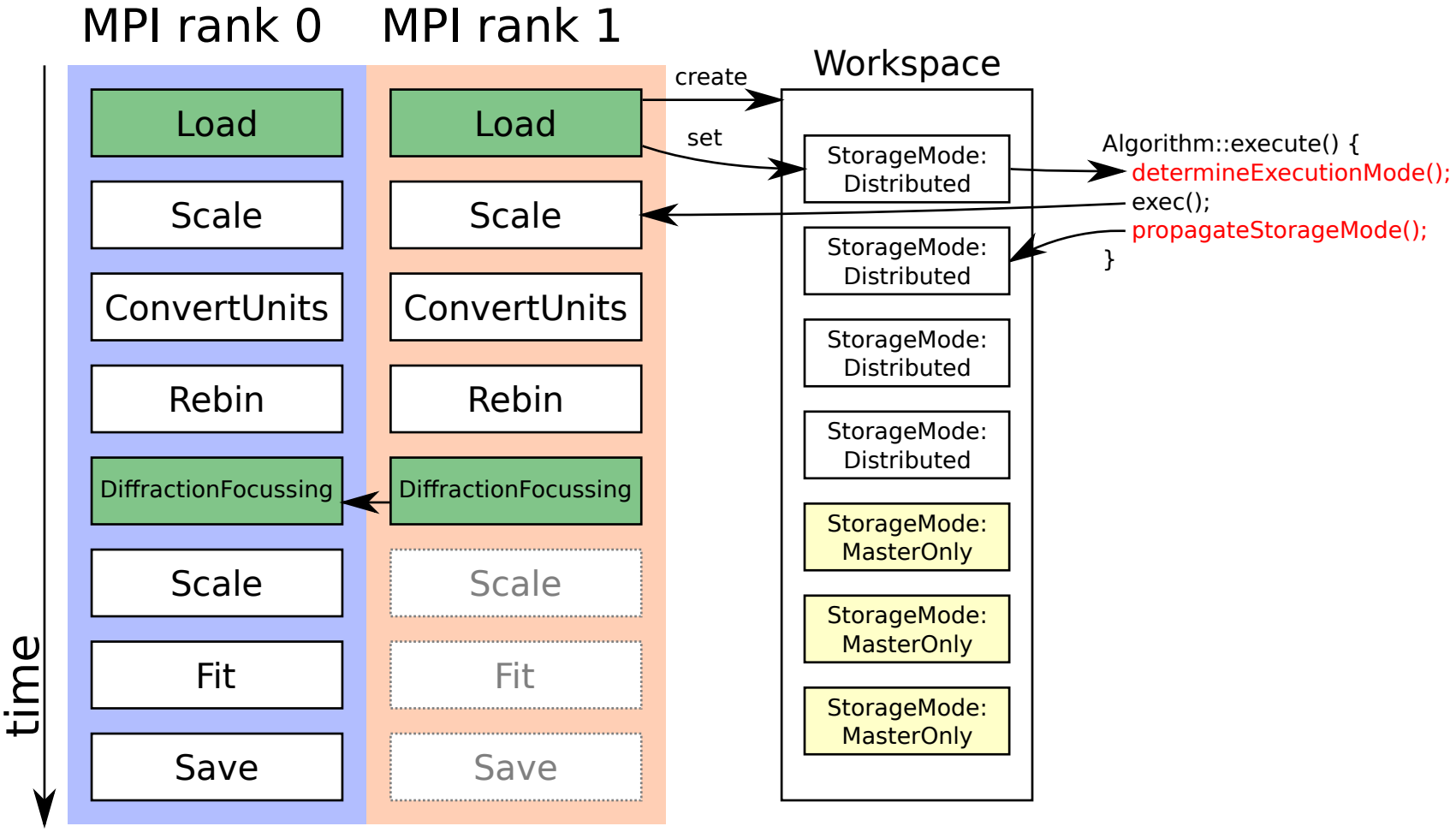
MPI model based on by-spectrum work distribution



- detectors from all ranks are interleaved ⇒ good load balance
- gathering a workspace in general not feasible in event mode, but can probably be avoided in most scenarios

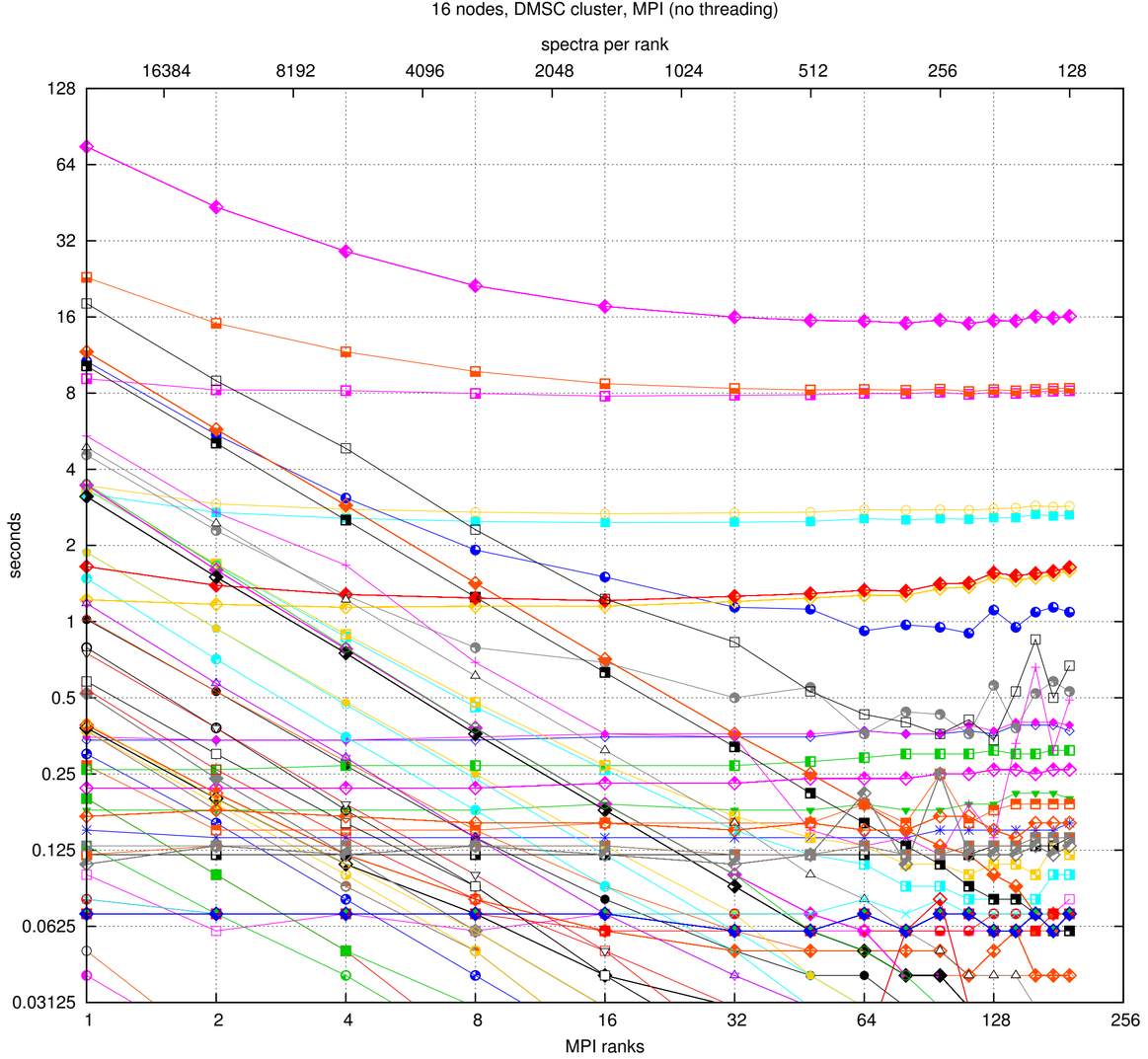
MPI model (implementation)



- `Workspace StorageMode` ⇒ `Algorithm ExecutionMode`
- default implementation for “trivially parallel algorithms” that can run in parallel out of the box

Test

- `SNSPowderReduction`
  - disabled the existing MPI implementation
  - disabled `preserveEvents` in `DiffractionFocussing`
- test with POWGEN (PG3 system test)
  - data file with 17.9 M events
  - vanadium file with 65.8 M events
  - background file with 1.7 M events
- test runs on DMCS workstation and DMSC cluster (12 cores/node, Infiniband)
- MPI runs use only a single thread per rank



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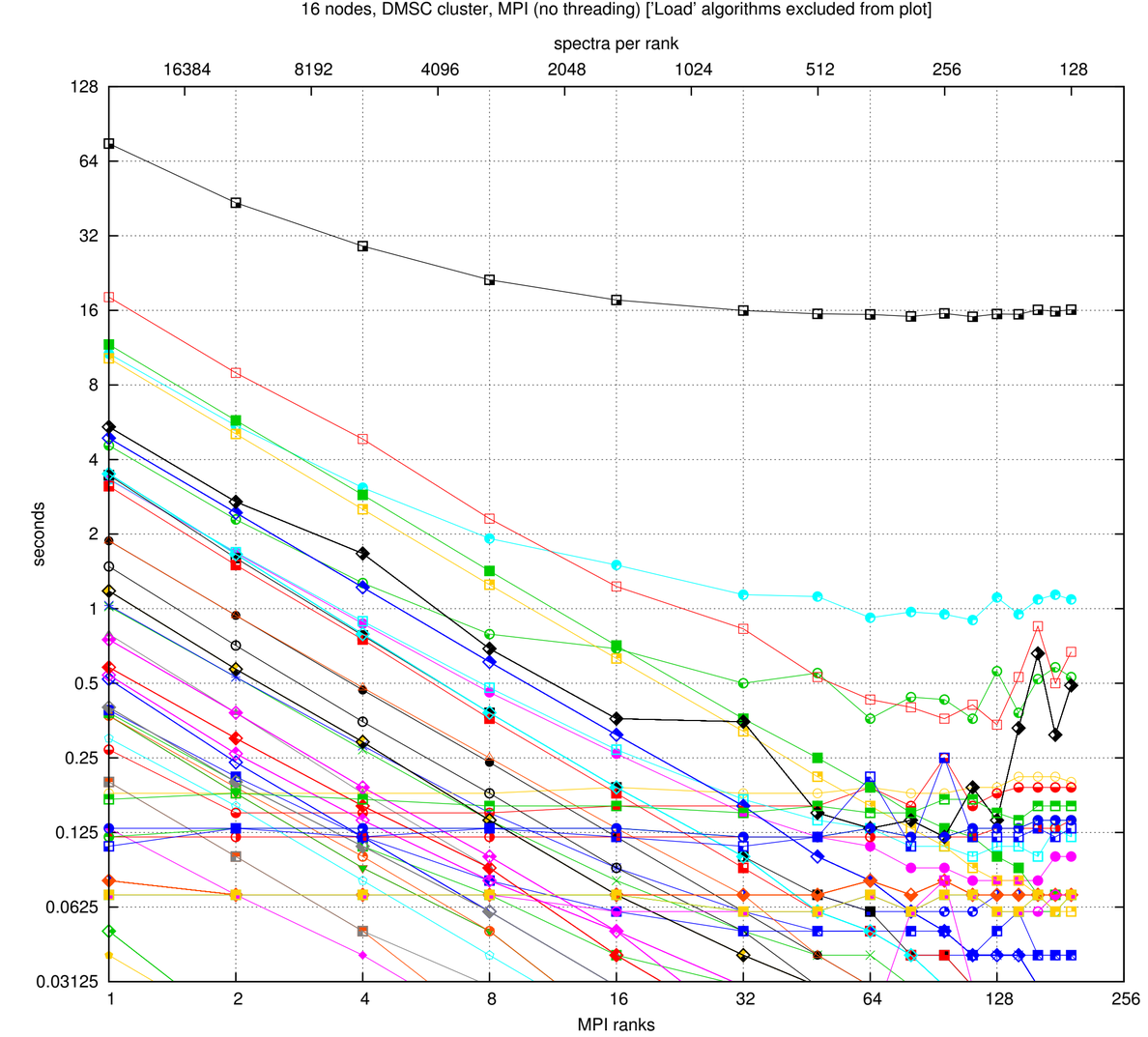

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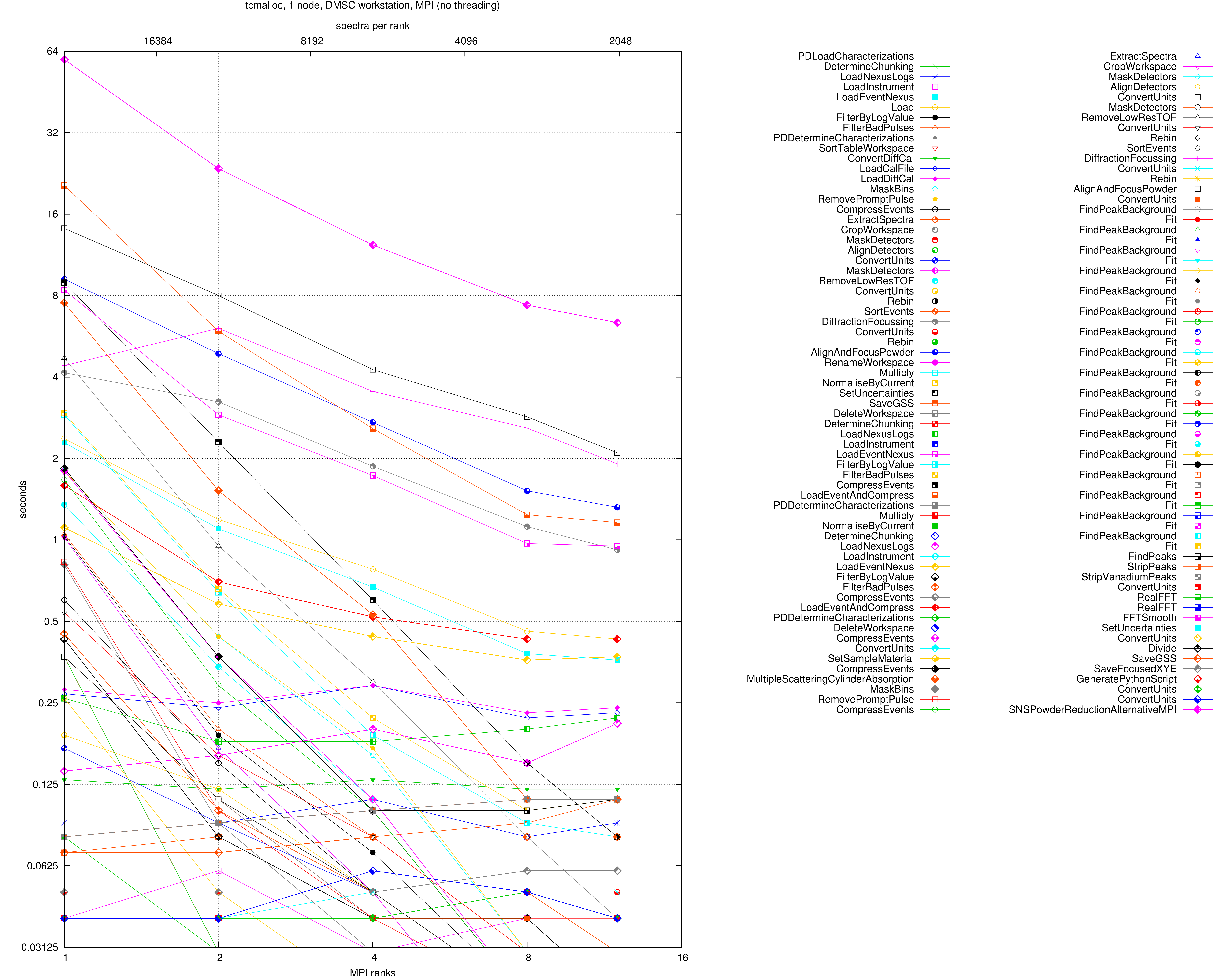
tcmalloc, 1 node, DMSC workstation, MPI (no threading)
spectra per rank
16384
8192
4096
2048
64
32
16
8
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0.5
0.25
0.125
0.0625
0.03125
seconds
1
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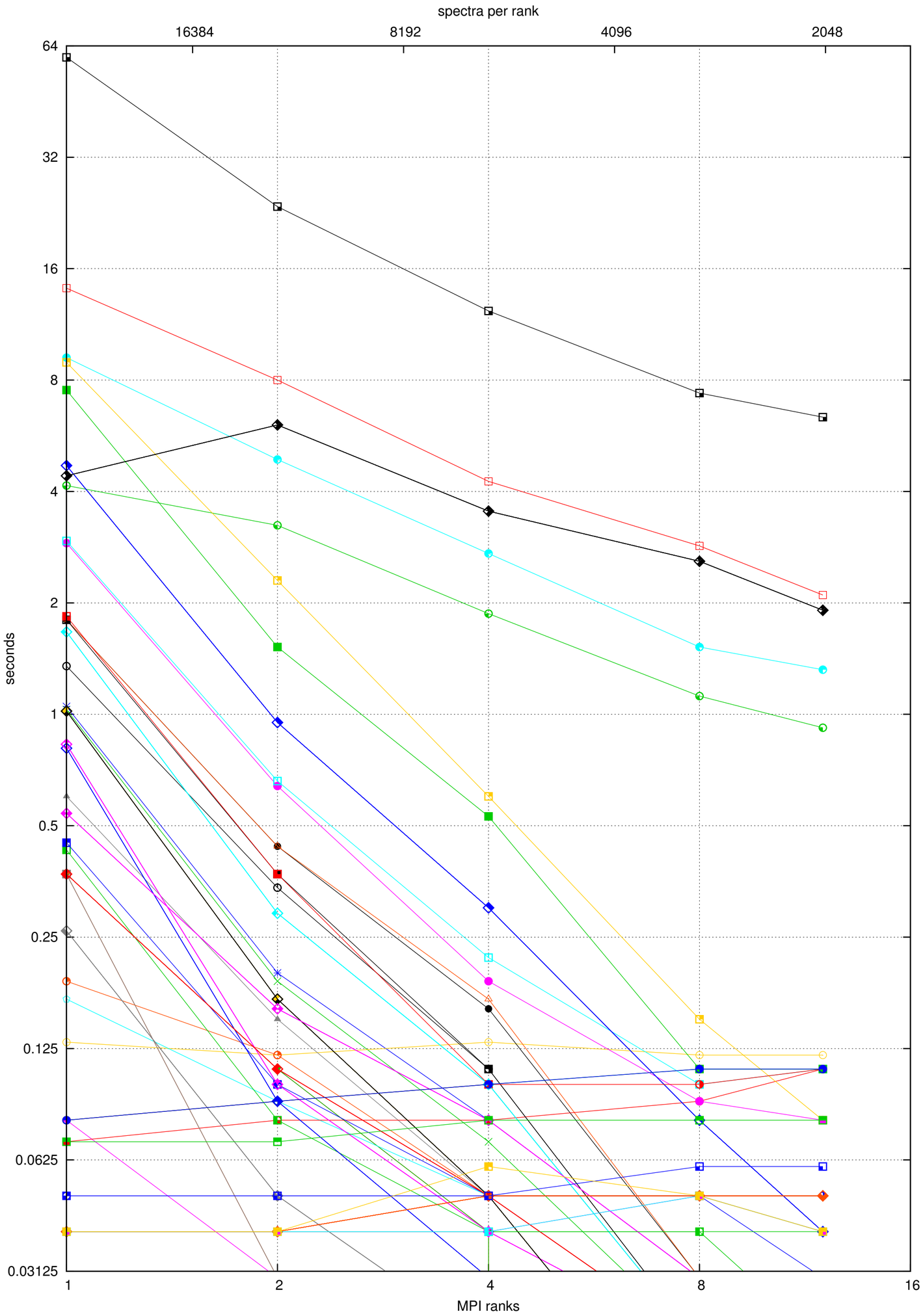

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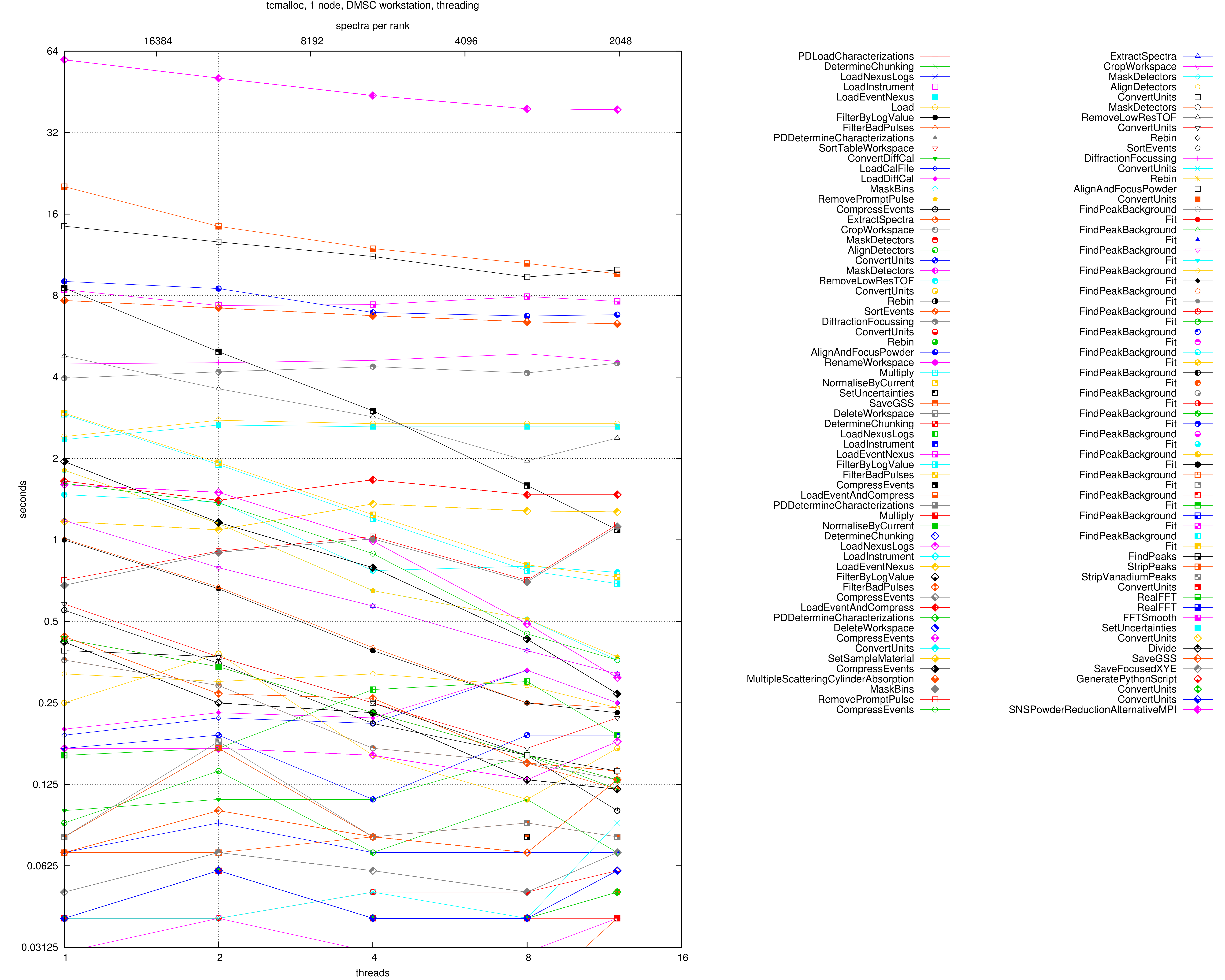

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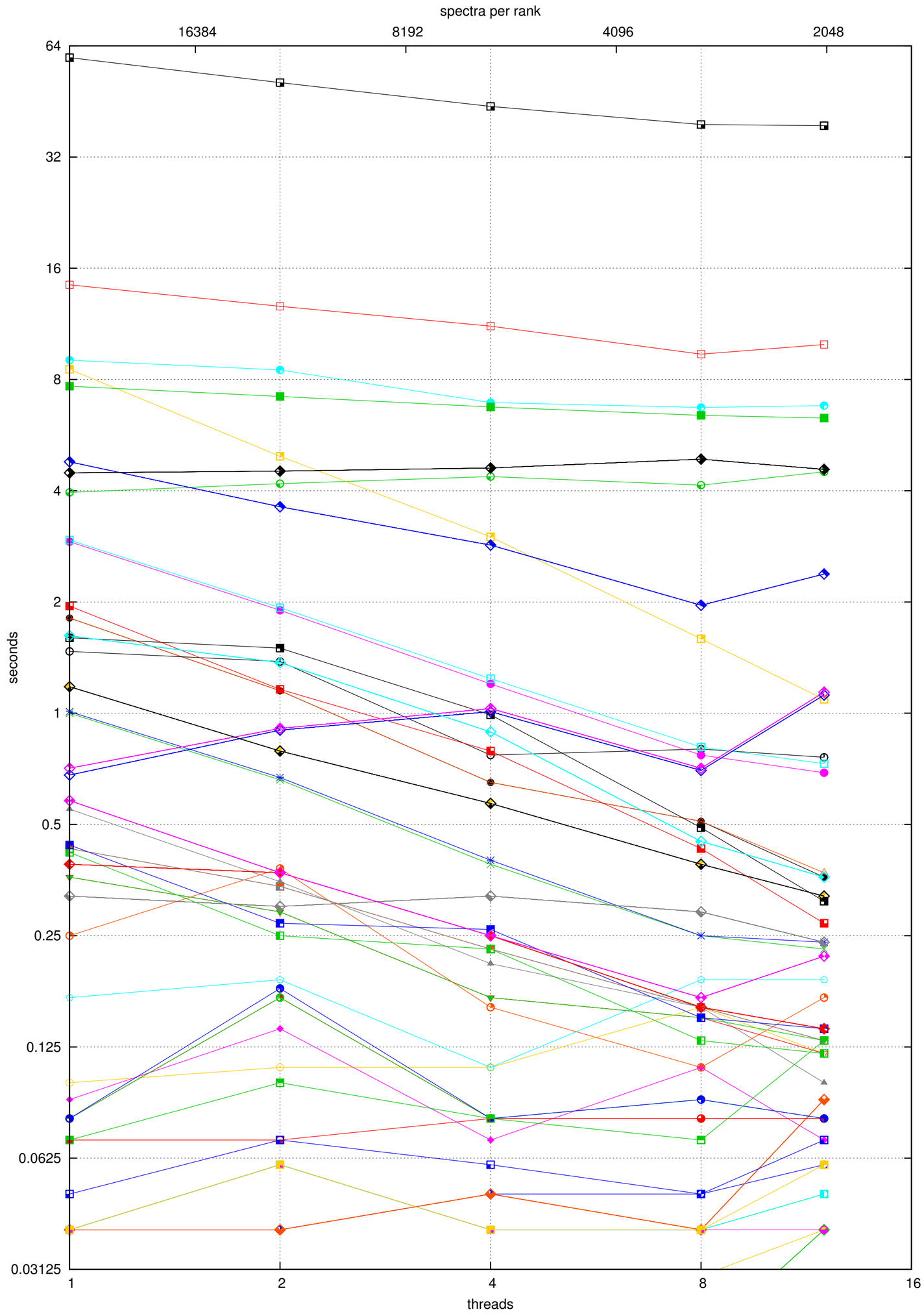

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