Collaborative Research: SI2-SSI : EVOLVE: Enhancing the Open MPI Software for Next Generation Architectures and Applications

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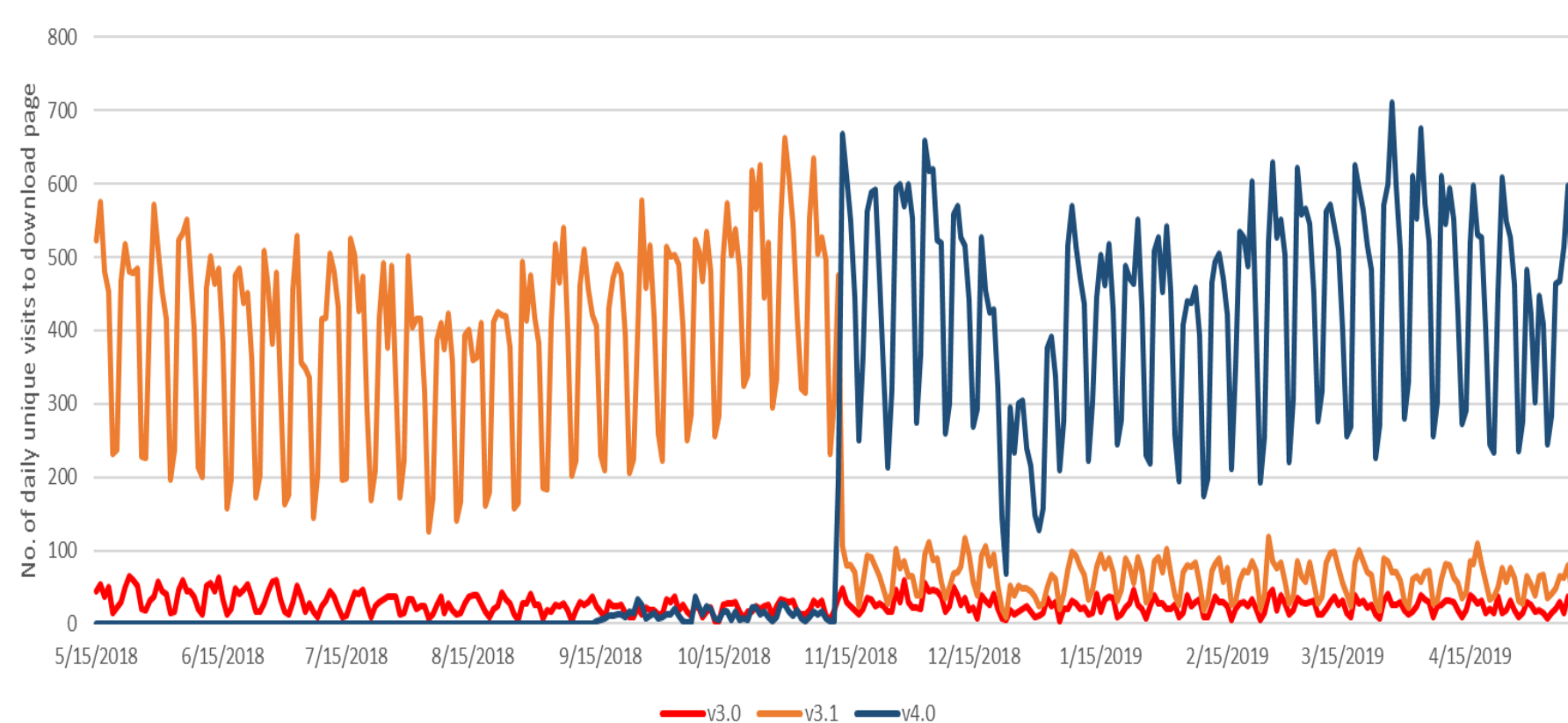[1] University of Houston, [2] The University of Tennessee, Knoxville

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Open MPI

➢ Widely used implementation of the Message Passing Interface Specification
➢ Jointly maintained by a consortium of academia, industry and national laboratories
➢ Over 60,000 downloads per year
➢ World-wide user community

Goals of the EVOLVE project

➢ Extend Open MPI to support new features of the MPI specification
  ➢ Hybrid programing models
  ➢ Fault tolerance
➢ Support new architectures
➢ Improve scalability
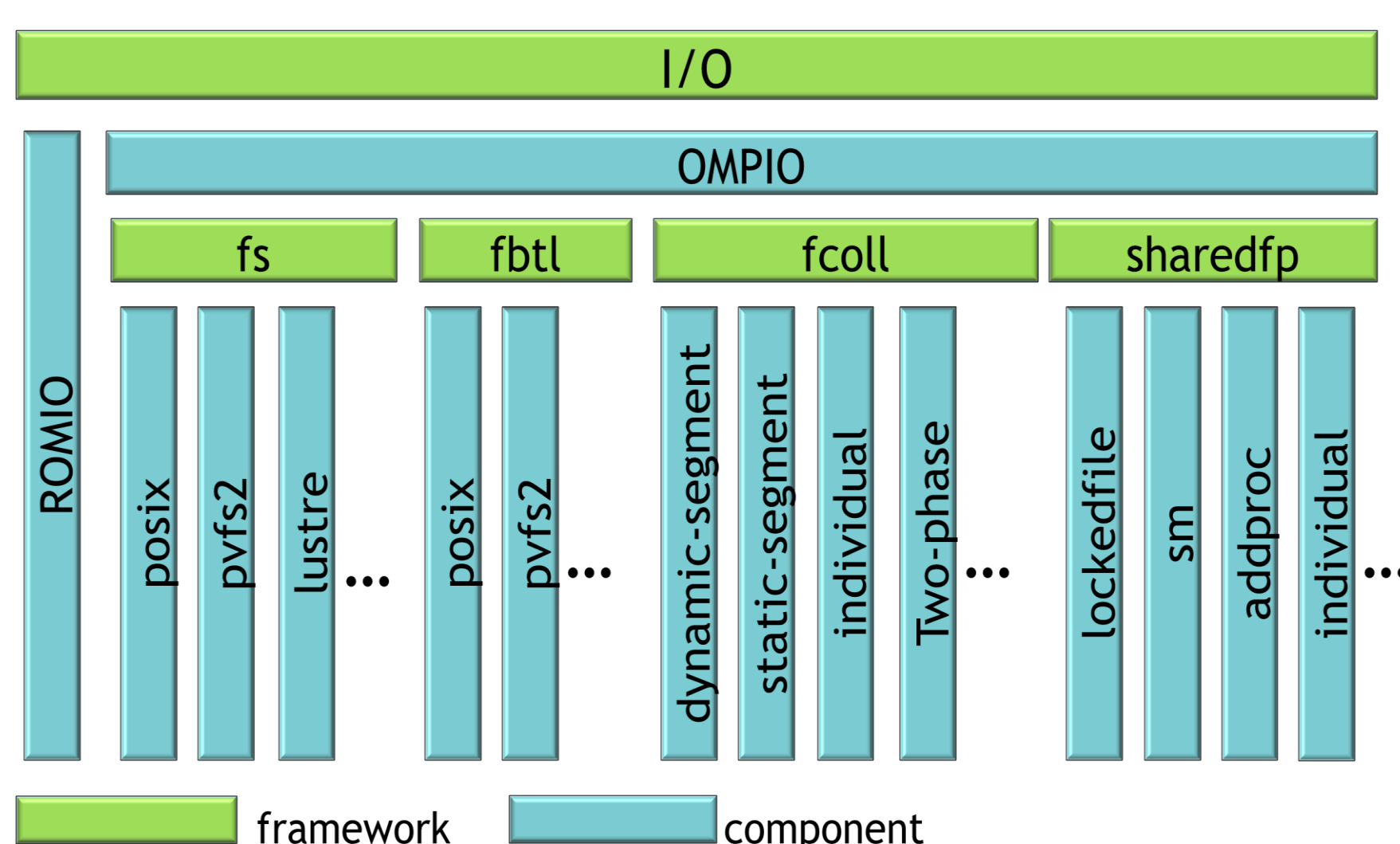➢ Enhance Parallel I/O performance and functionality

Open MPI Download statistics

Number of visits to the download page of Open MPI for the v3.0, v3.1, and v4.0 releases in the from 05/14/2018 until 05/14/2019.
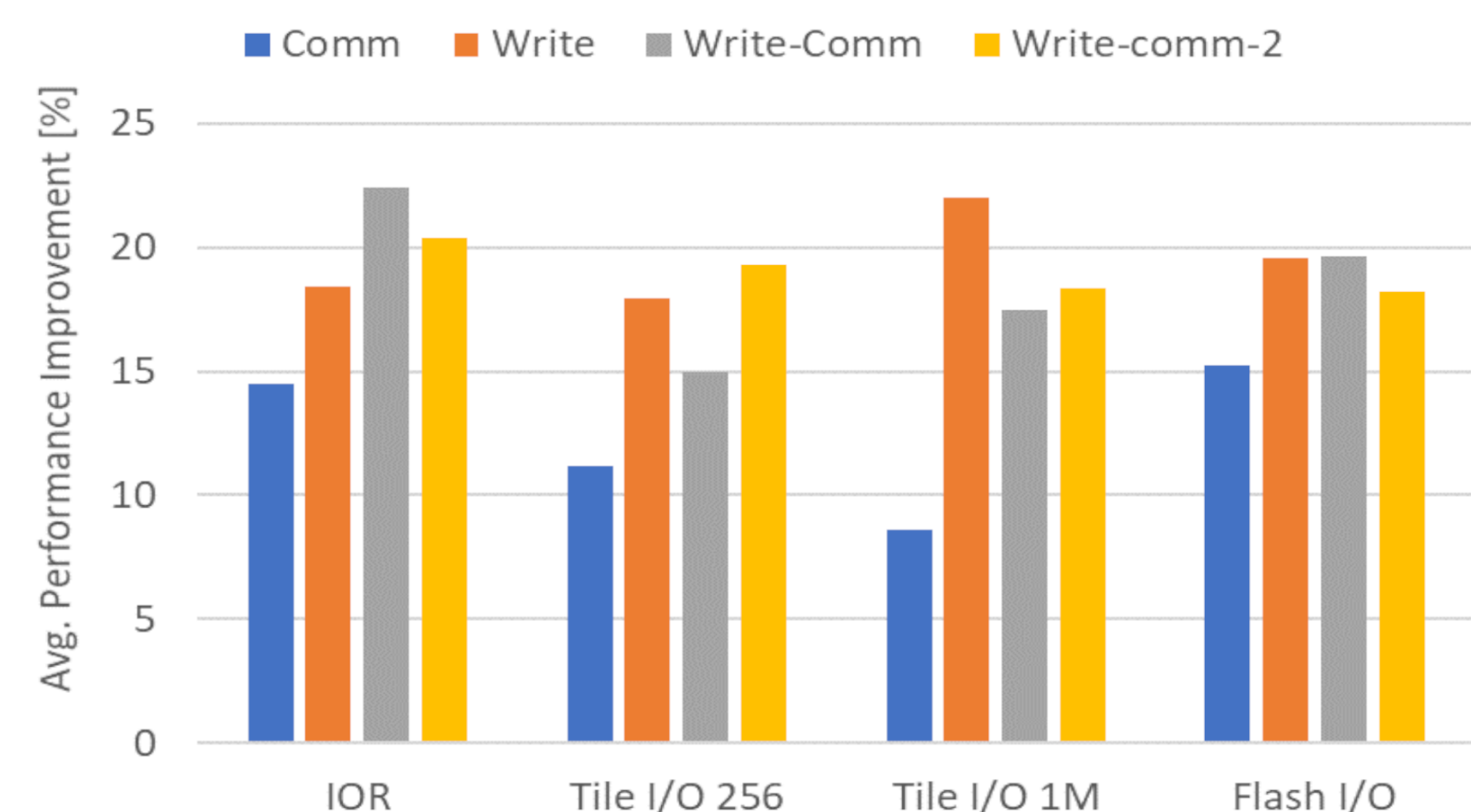
OMPIO

➢ Parallel I/O components of Open MPI
  ➢ Separates I/O functionality into frameworks
  ➢ Dynamic runtime selection of components
➢ Integrated with Open MPI derived data type engine
➢ Integrated with Open MPI progress engine for asynchronous I/O operations

Overlapping multiple cycles in collective I/O
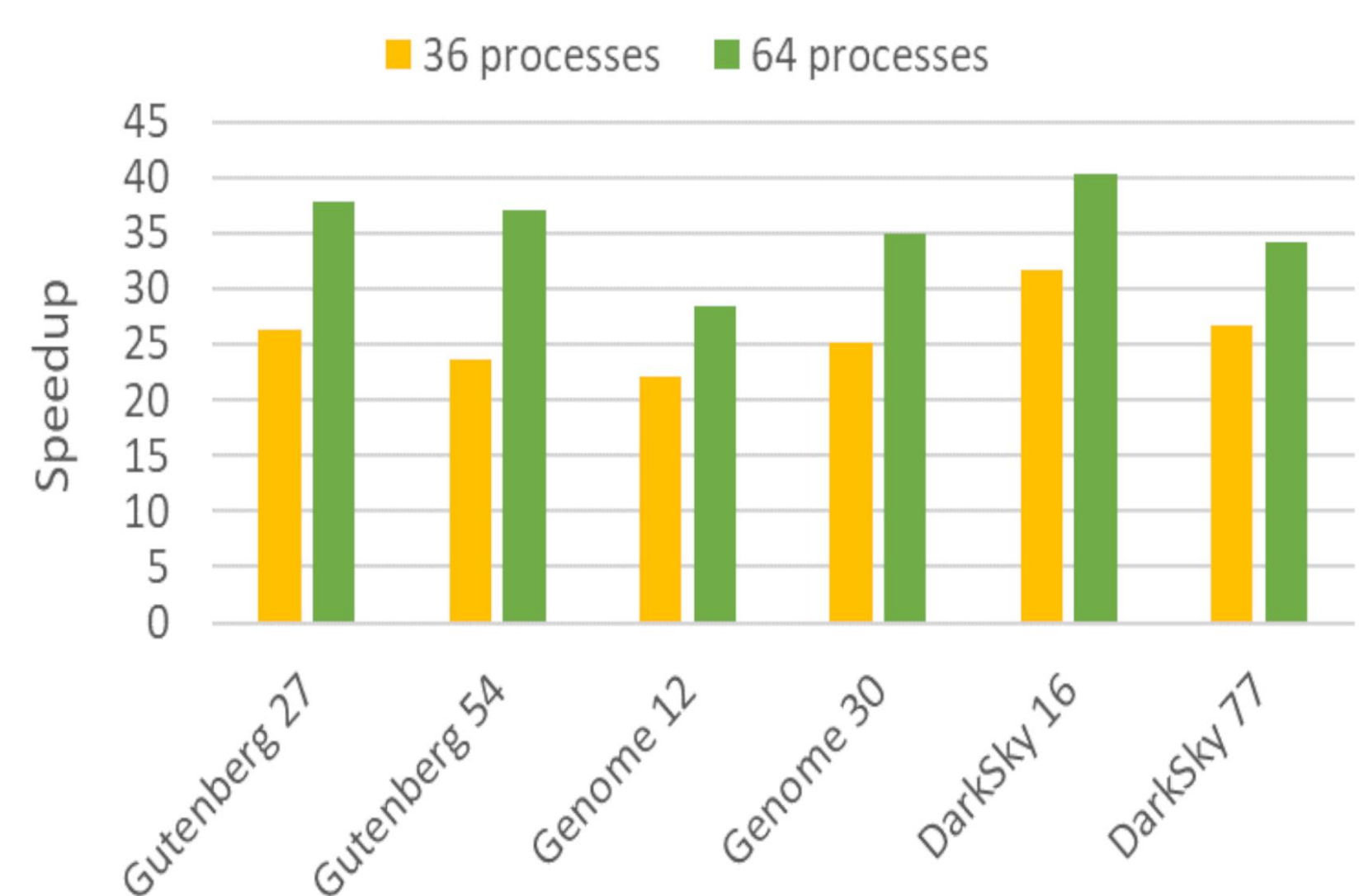
➢ Performance improvement for collective I/O through internal pipelining
➢ Multiple algorithms evaluated based on different overlap strategies
➢ Multiple data transfer primitives (two-sided, one-sided) explored

Average performance improvement of collective write operations for various overlap algorithms

Compression in Parallel I/O

➢ Extend collective I/O to support reading and writing compressed data files
➢ Prototype implementations developed for Snappy compression algorithm

Speedup of a parallel compression tool using collective I/O over a sequential compression tool

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[1] M. Chaarawi, E. Gabriel, R. Keller, R. Graham, G. Bosilca and J. Dongarra, 'OMPIO: A Modular Software Architecture for MPI I/O, EuroMPI 2011.
[2] Shweta Jha and Edgar Gabriel, 'Performance Models for Communication in Collective I/O Operations', CCGRID Workshops 2017.

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