20th Anniversary
1999-2019

SC97 Tutorials, San Jose

Sunday, November 16
Full Day 8:30am-5pm

How to build a Beowulf: Assembling, Programming, and Using a Clustered PC Do-it-yourself Supercomputer

Thomas Sterling, California Institute of Technology

It has recently become possible to assemble a collection of commodity mass market hardware components and freely available software packages in a day and be executing real world applications by dinner time to achieve a sustained performance at greater than 1 Gflops at a total cost of around $50,000. Furthermore, on almost a daily basis, these numbers are improving. This full-day tutorial will cover all aspects of system assembly, integration, software installation, programming, application development, system management, and benchmarking. Demonstrations with actual hardware and software components will be conducted throughout the tutorial. Participants will be encouraged to closely examine and manipulate elements of a Beowulf at various stages of integration with strong Q&A interaction between presenters and attendees. The presenters will include David Bailey (applications benchmarking), Don Becker (networking), Jack Dongarra (applications benchmarking), Al Geist (PVM), Ewing (Rusty) Lusk (MPI), John Salmon (applications), and Thomas Sterling (system structure).

Biowulf 1999

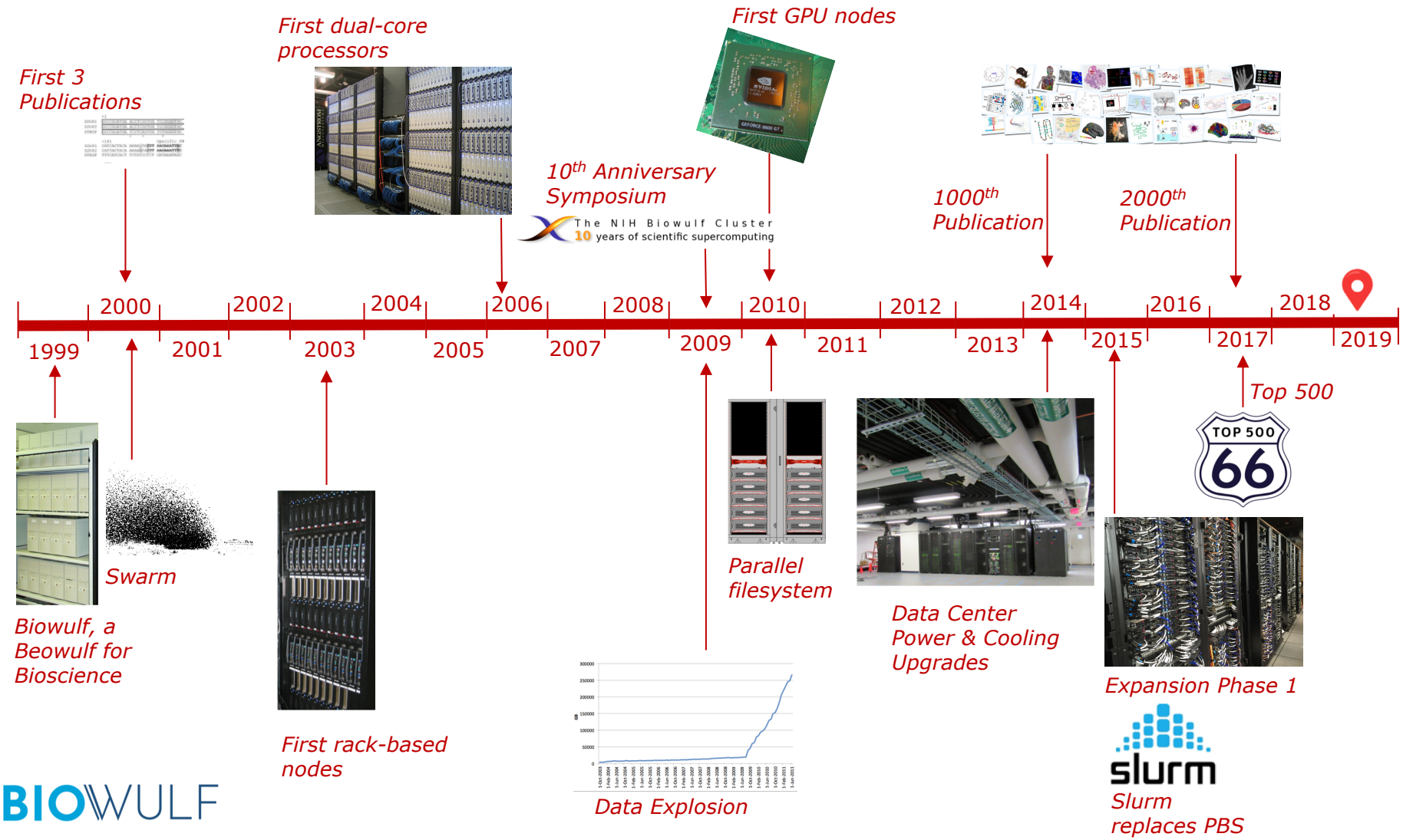
- Compute cores: 80
- GPUs: huh?
- Fileservers: 2
- Storage: Gigabytes
- Networking: 100 Mb/s
- Applications: 2
- Staff: 2
- Publications: 0

Biowulf 2019

- Compute cores: 95,000
- GPUs: 560
- Fileservers: 82
- Storage: Petabytes
- Networking: 100 Gb/s
- Applications: 661
- Staff: 18
- Publications: 2486

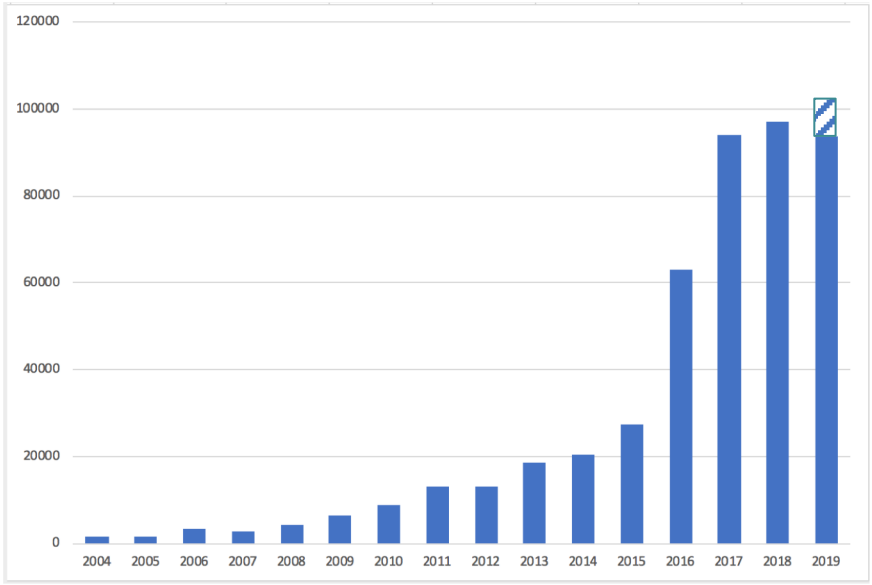
BIOWULF

Getting from There to Here…

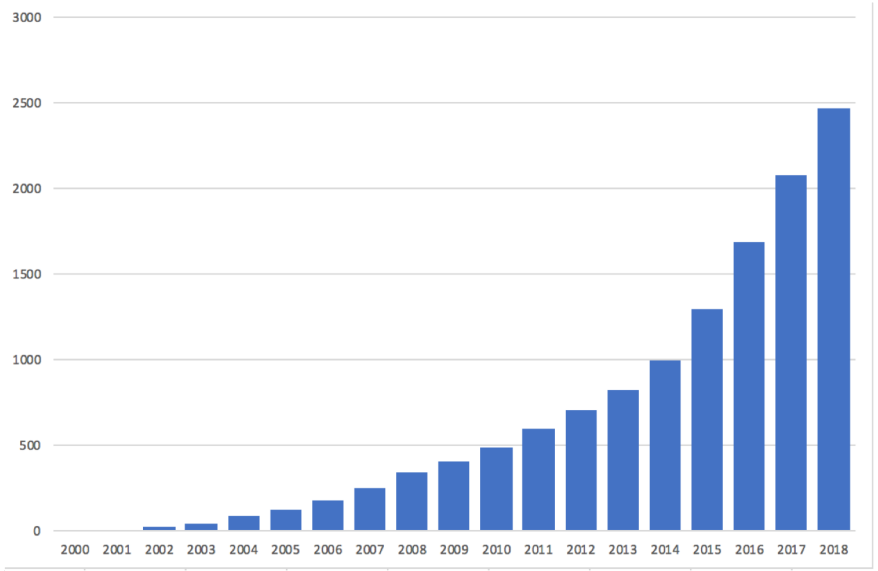


Twenty Years Growth

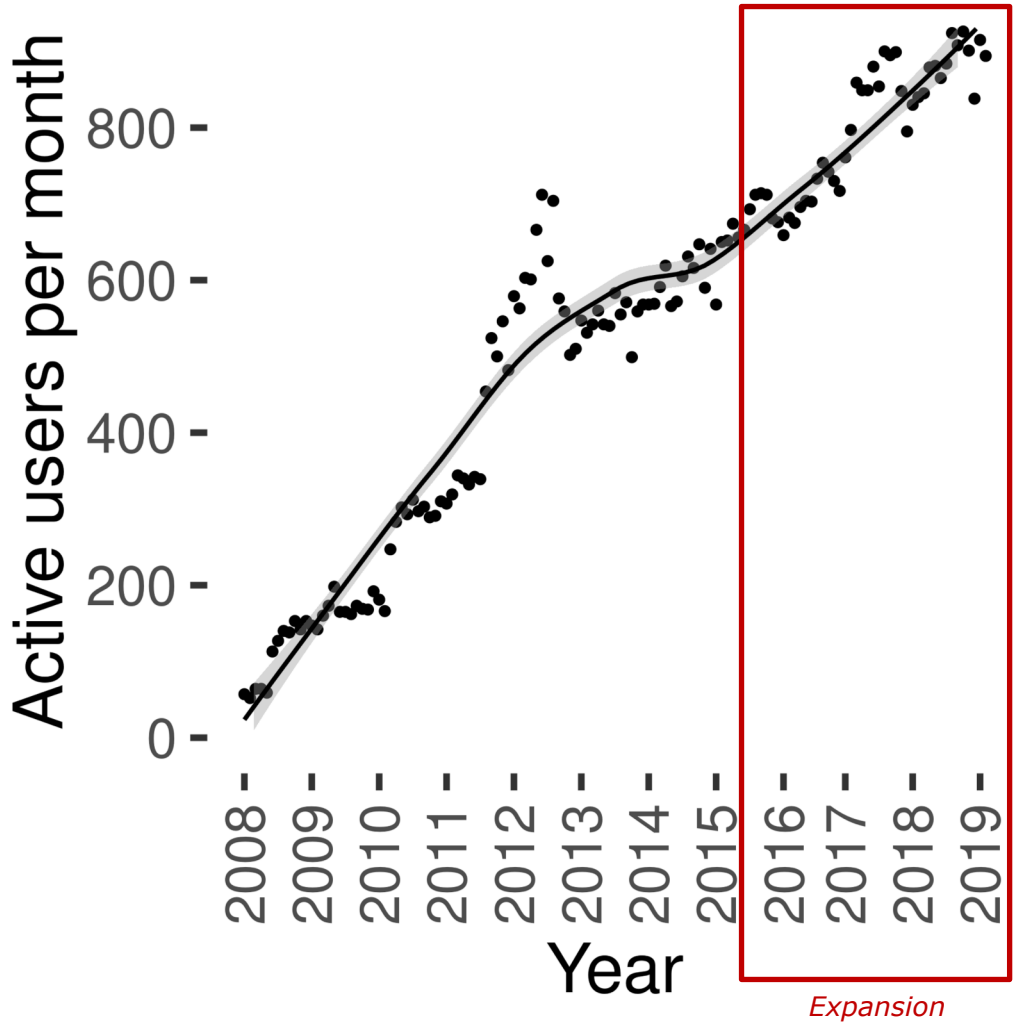
Compute Cores



Publications Using Biowulf



Active Users



1525 users in 2018

470 (43% of NIH) Principal Investigators

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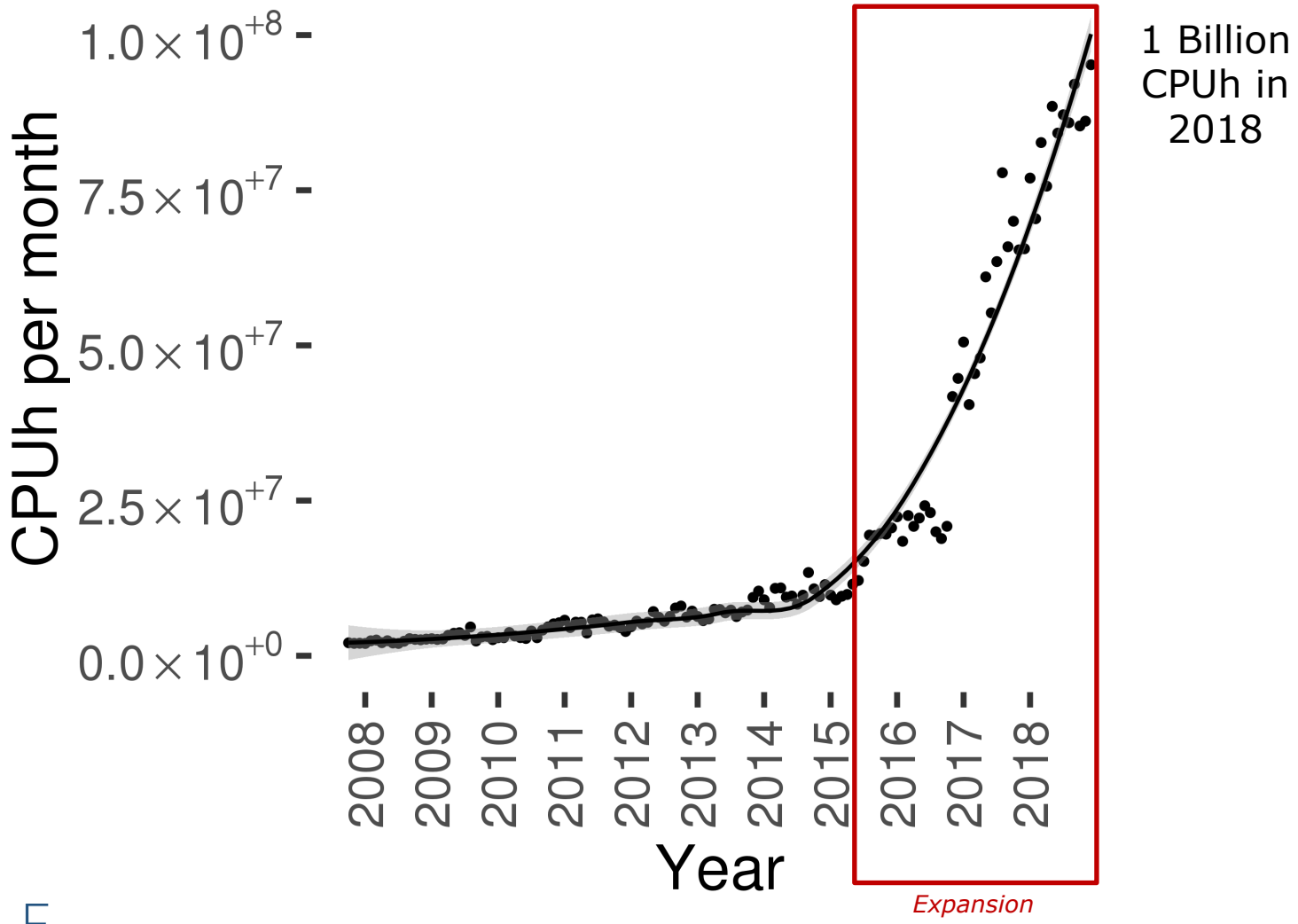
CPUh Used



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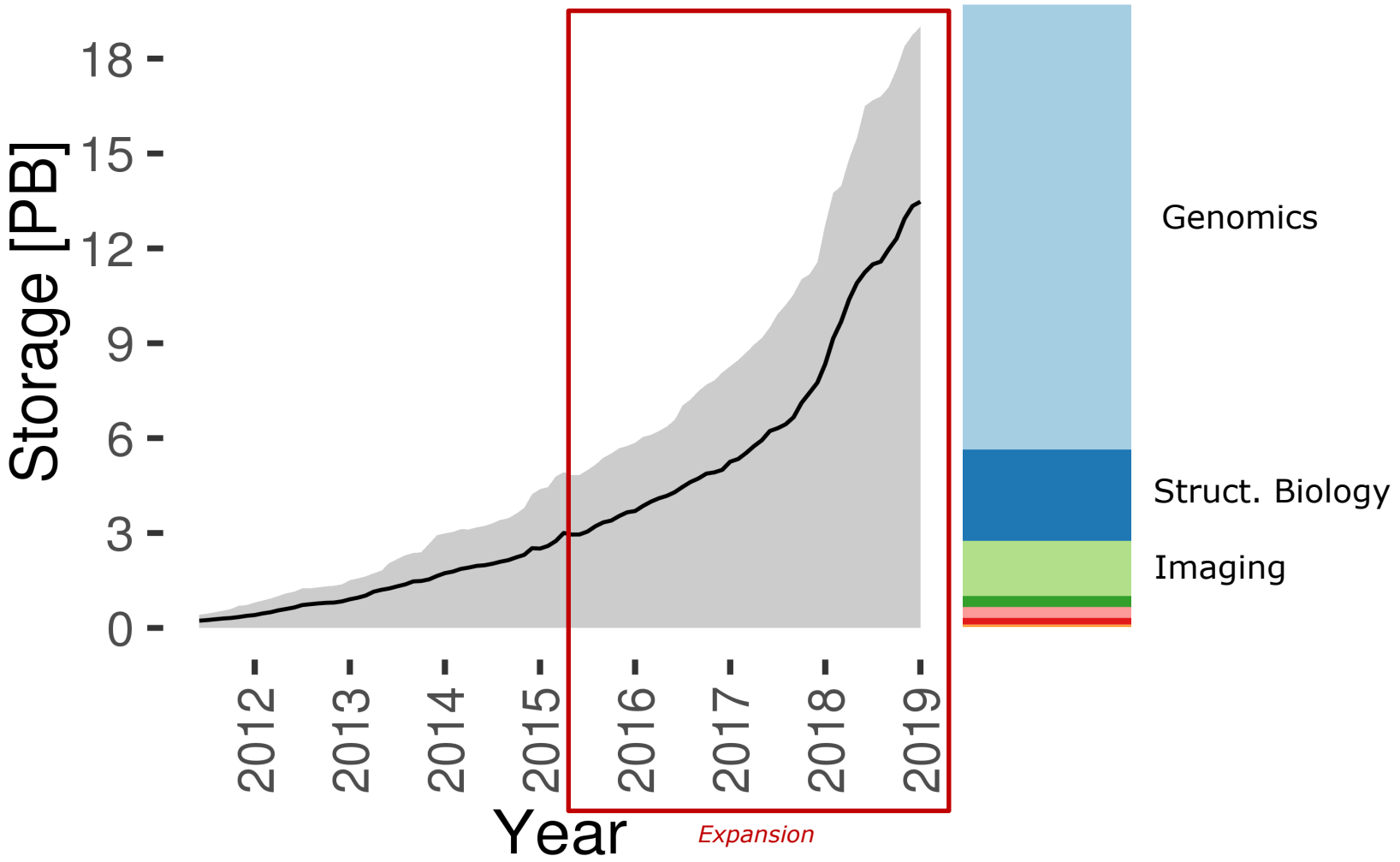
Data Storage



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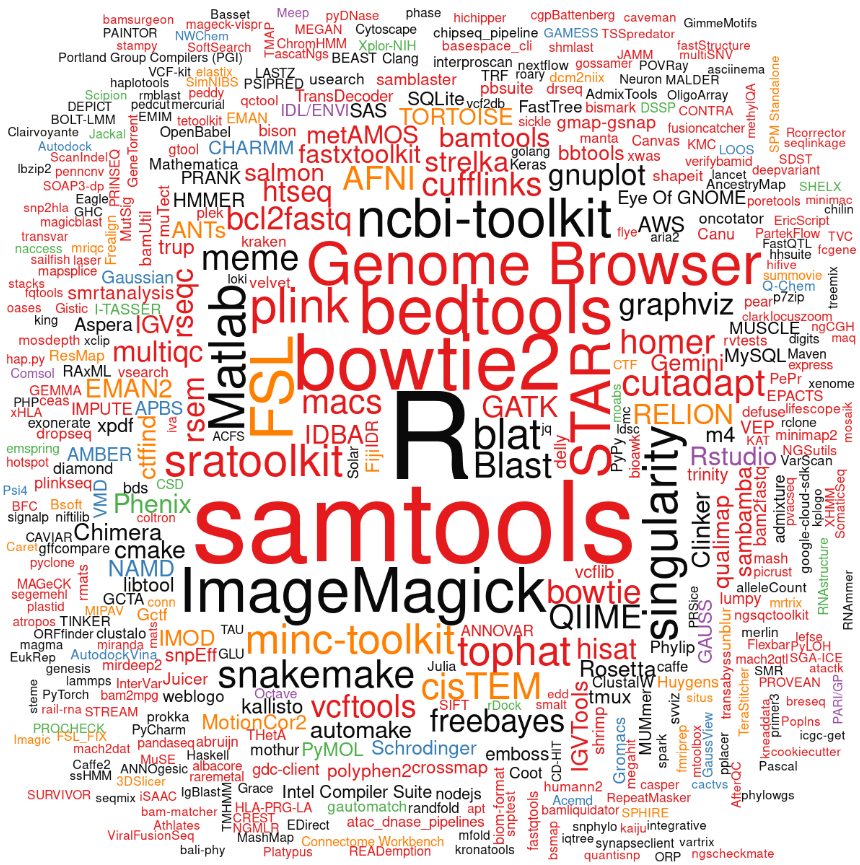
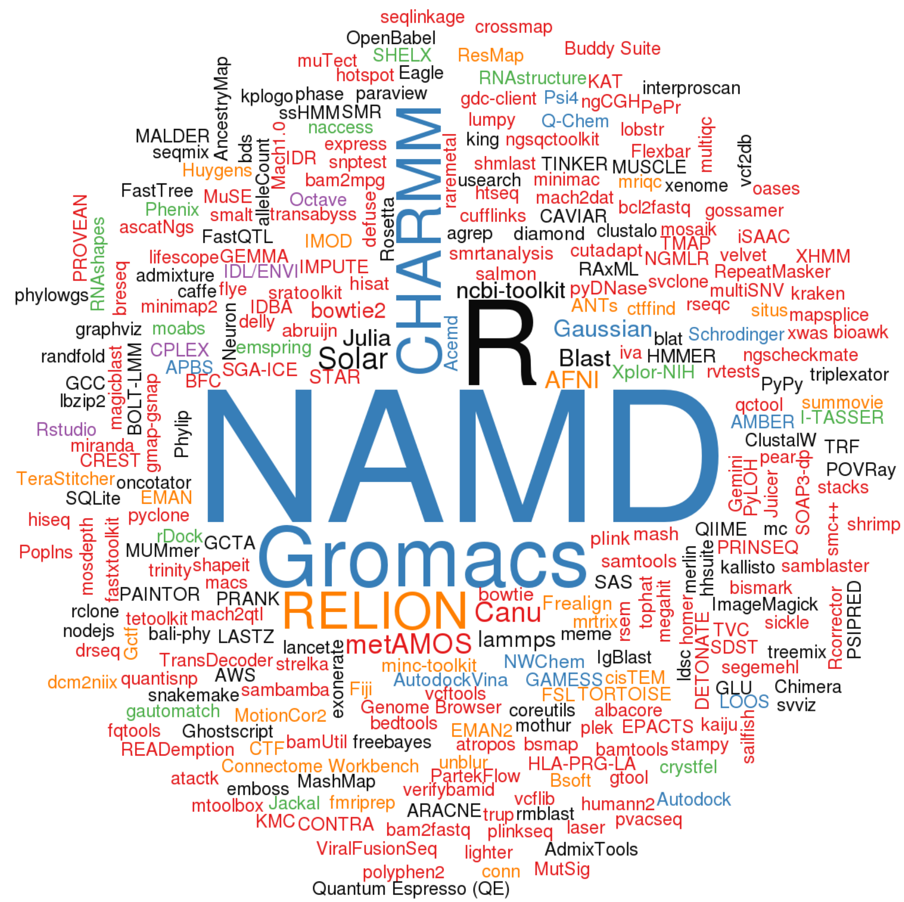
Over 660 Applications Installed & Maintained

Based on #times run



Based on CPUh



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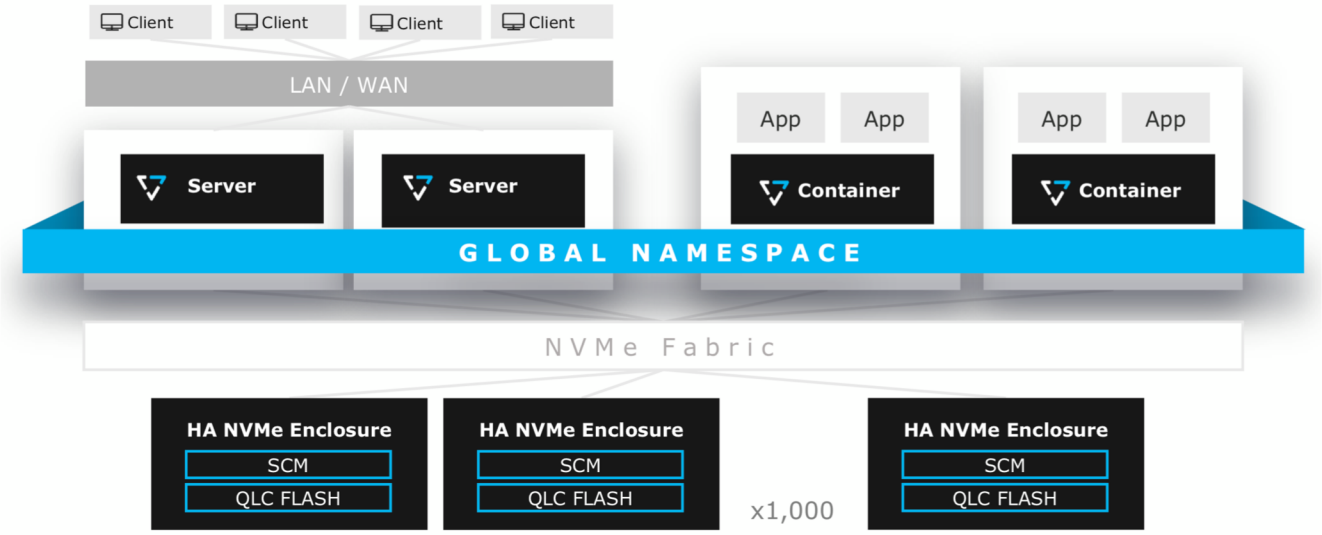
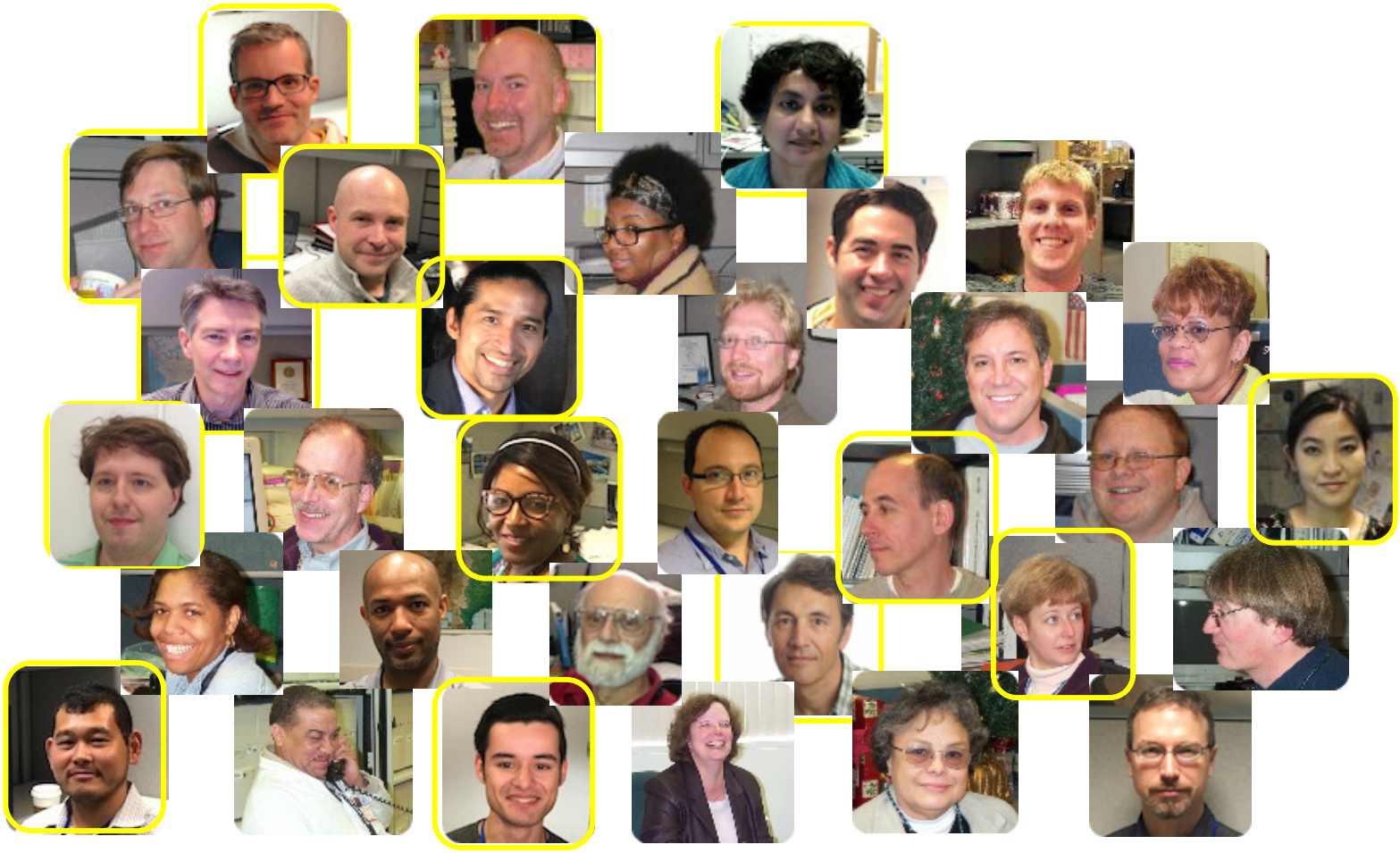
Phase 5: Coming Summer 2019

- 6,912 “Skylake” compute cores (384 GB/node)
- 224 V100 GPUs (32 GB, NVLINK)
- 100-200 Gb/s Infiniband networking
- Solid State network-based shared storage



Biowulf Staff 1999-2019



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HIGH PERFORMANCE COMPUTING AT THE NIH