



Looking Back on the Last 5 Years of Containers



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Who here heard about
Linux Containers?



Containers - 2012 through 2014



- DevOps teams fall in love with containers as pressure to organize the from-source-to-production pipeline. Separation of concerns, growth of microservices and cloud fuel the fire.
- Containers <> VM's
- March 2013, Docker open sourced by dotCloud
- October, 2013 R.I.P dotCloud, long live Docker, Inc.
- November, 2013 UberCloud defined its HPC Container Roadmap
- October, 2014 Docker Version 1



Containers - ISC 2015 and 2016



OpenFOAM Test: Bare Metal vs Docker



Simple Average of the 3 runs and comparison between Bare Metal and Container

	Serial (1 Host x 1 CPU) = 1 Core Total	1 Host Parallel (4 Host x 1 CPU) = 4 Core Total	2 Host Parallel (2 Host x 2 CPU) = 4 Core total
Bare Metal	10,847	2,040	1,842
Container	10,869	1,851	1,852
Overhead	0.20%	-9.30%	0.51%

Performance Test Results demonstrating comparison between the same OpenFOAM run (with 1.4 million cells) repeated on bare metal and in a Docker container.

Docker containers for HPC take shape:

- Multi-node parallelism
 - MPI functional, stable
 - Few HPC workloads containerized
 - Performance characteristics understood
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- Singularity announced by LLNL
 - Shifter announced by NERSC

Container workshops at ISC 2015 & 2016:
Docker: User-Friendly Application & Service
Containers for HPC Environments.



Containers - ISC 2017



- Containers! Growing popularity in HPC community. Standing room only at the ISC Workshop.
- Toolset grows with Kubernetes, Singularity, Shifter, Docker, Charliecloud, others.
- Customer success stories emerge
- Orchestration: Integrations with HPC Schedulers

Containers - ISC 2018



- March 2018, Au revoir Solomon
- Singularity popularity among HPC Centers increasing.
- Containers used widely in HPC. Singularity, Shifter, Docker success stories and best practices emerge.
- Orchestration is well understood, multiple HPC schedulers support containers
- Advanced topics are well understood (GPU's, Infiniband)
- Shortcomings, roadmaps are documented in a clear way



Containers - ISC 2019



- Containers are being used for HPC workloads on HPC Centers, Clouds, on-premise clusters.
- Orchestrators widely support containers.
- Community is aware of containers, benefits, best-practices.
- Gaps and roadmaps are clear.
- Your comments:





Thank you

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