



<http://gerardable.com/wp-content/uploads/2014/12/docker-whale-home-logo.png>

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Docker: Testing the Waters

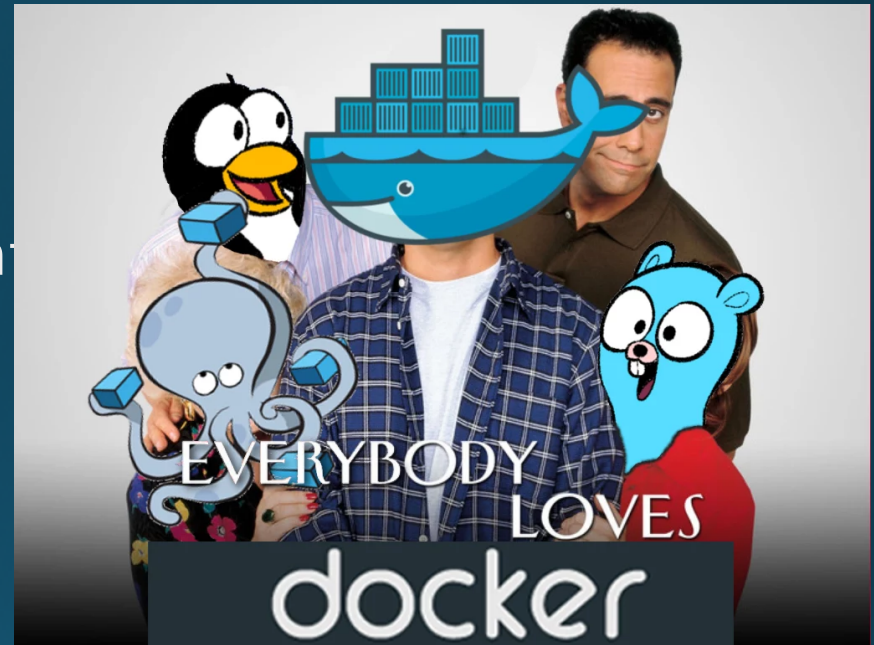
LA-UR 15-25901

Docker: There's No Containing this Whale!

- Free, open-source
- Wraps applications into packages
- Docker Images
- Resource isolation
- Independent of LXC
- Very popular (buzzword compliant)
 - Open Container Project (OCP)
 - RHEL Atomic Project

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Research Objectives

- Explore basic features/functionality
- Build process
 - Images
 - Local registry
- Mixed OS/mixed versions
- Security + Maintenance
 - Updating inside containers
- Inventory
- Workload testing
 - Comparison to VMs

Test Environment

- 11 HP ProLiant DL380p Gen8 servers
 - 2 Intel Xeon E5-2620 processors
 - 24 GB DDR3 ram
 - CentOS 6.6
 - Docker 1.6.0
- Extreme networks 10G ethernet switch
- Mellanox QDR InfiniBand switch

Docker Setup

- Docker 1.6.0
 - CentOS 6.6 uses kernel 2.6
 - Docker 1.7.0 requires kernel 3.10
- Docker 1.7.1

Docker Images + Registries

- Image build process
- Docker Hub
- Local registry
 - Source code modification

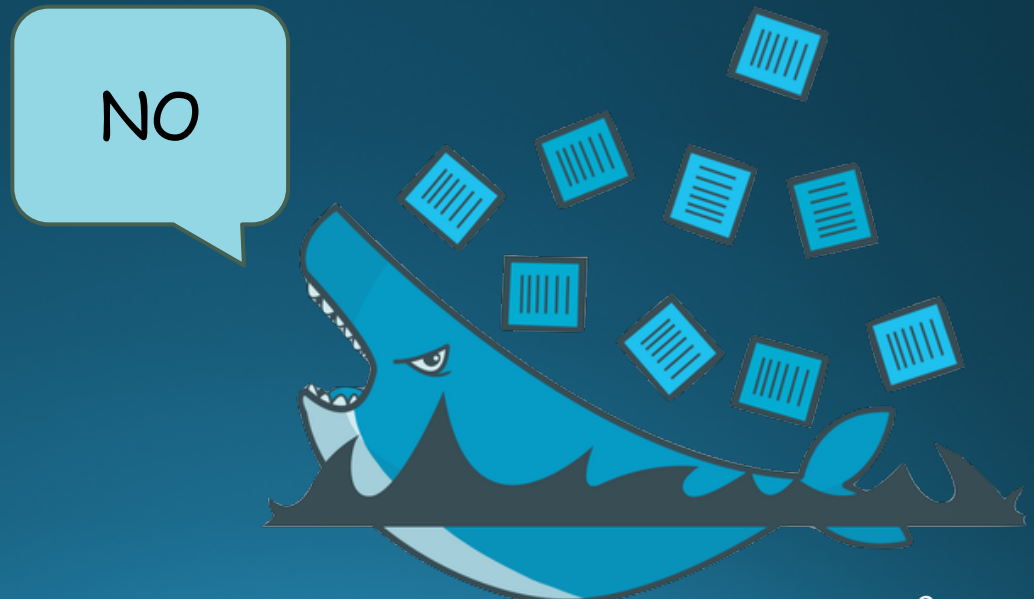
Mixed OS Mixed Versions

Container OS

Host OS	CentOS 5	Cent OS 6	CentOS 7	Ubuntu 10	Ubuntu 14	Ubuntu 15	
	CentOS 5	No	No	No	No	No	No
	CentOS 6	Yes	Yes	Yes	Yes	Yes	Yes
	CentOS 7	Yes	Yes	Yes	Yes	Yes	Yes
	Ubuntu 10	No	No	No	No	No	No
	Ubuntu 14	Yes	Yes	Yes	Yes	Yes	Yes
	Ubuntu 15	Yes	Yes	Yes	Yes	Yes	Yes

Auto Updates

- No init.d
- No cron
- Bash profile



Spacewalk

- System management suite
 - Push updates to clients
 - Hardware and software inventory
 - Configuration management



SPACEWALK™
SPACEWALK

<http://spacewalk.redhat.com/img/spacewalk-logo.png>

Spacewalk

The screenshot displays the Spacewalk web interface. At the top, there is a navigation bar with the Spacewalk logo, language options (English), Knowledgebase, Documentation, user profile (eholm), and organization name (Spacewalk Default Organization). A search bar is located on the right side of the navigation bar. Below the navigation bar is a main menu with tabs for Overview, Systems, Errata, Channels, Audit, Configuration, Schedule, Users, Admin, and Help. The Overview tab is selected, and the page content shows the Overview page. On the left side, there is a sidebar with a navigation menu and an Overview Legend. The main content area is divided into two columns. The left column contains a 'Tasks' section with several links for managing entitlements, activation keys, kickstarts, configuration files, organizations, and Spacewalk. The right column contains an 'Inactive Systems' table with columns for System, status, and duration. A link to 'View All Inactive Systems (7)' is located below the table.

English (change) Knowledgebase Documentation eholm Spacewalk Default Organization

Systems Search

Overview Systems Errata Channels Audit Configuration Schedule Users Admin Help 8 systems selected Manage Clear

> Overview
> Your Account
> Your Preferences
> Locale Preferences
> Subscription Management
> Organization Trusts

Overview Legend

- OK
- Warning
- Critical
- Unknown
- Locked

Overview

Tasks

- ▶ **Manage Entitlements and Subscriptions:**
[My Organization](#) | [Spacewalk-Wide](#)
- ▶ **Manage Activation Keys**
- ▶ **Manage Kickstarts**
- ▶ **Manage Configuration Files**
- ▶ **Manage Organizations**
- ▶ **Configure Spacewalk**

Inactive Systems

System	
n05.cerulean.com	1 Week(s)
n01.cerulean.com	1 Week(s)
n07.cerulean.com	1 Week(s)
n06.cerulean.com	2 Week(s)
n02.cerulean.com	2 Week(s)

[View All Inactive Systems \(7\)](#)

Docker Security

- File permissions / Missing devices
 - Dev
 - Proc
 - Sys
- Directory mounting
- Kernel module loading/removing
- No access to sockets

Security Testing

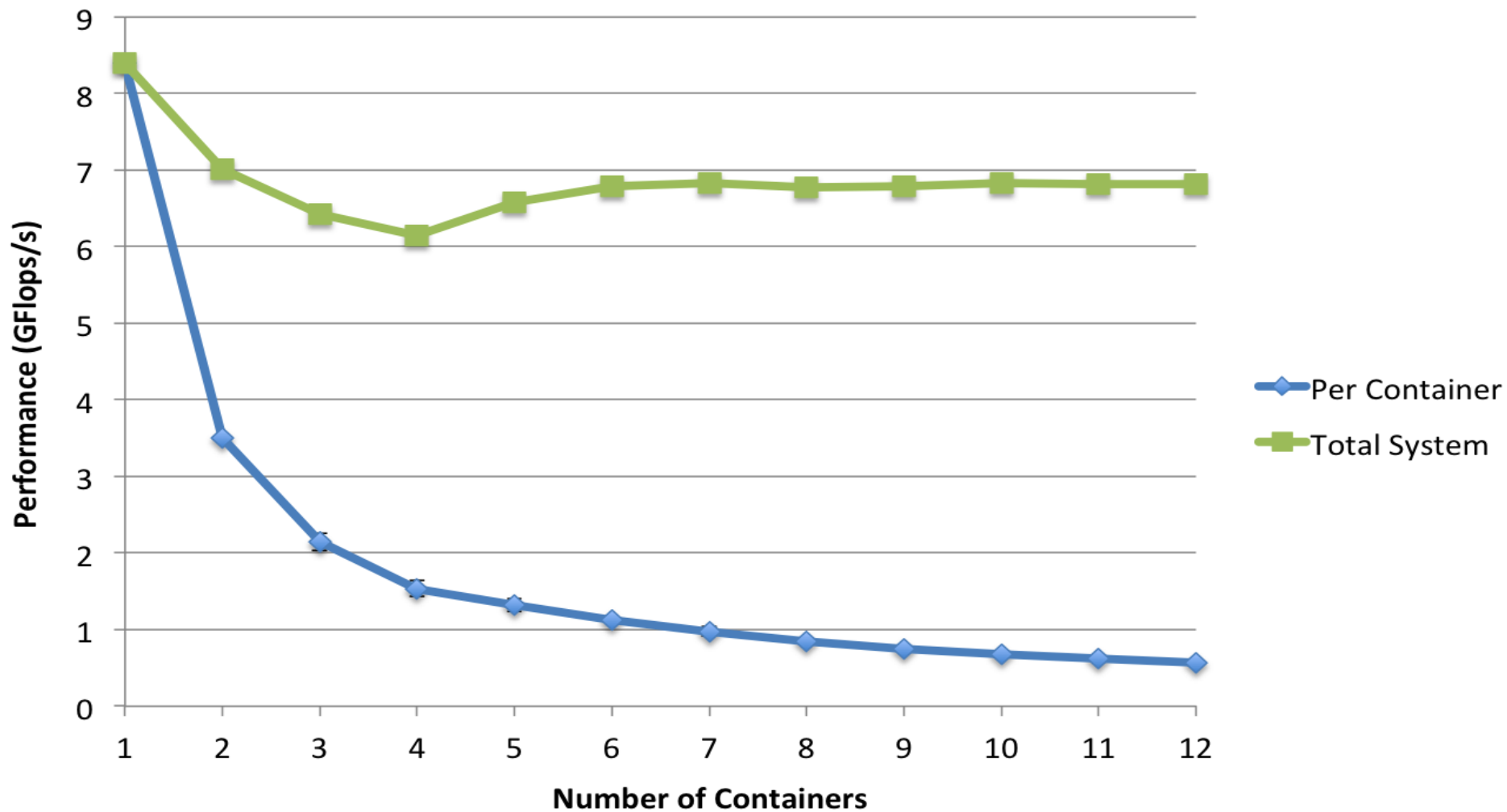
- Nessus scan
- Effect host system
- Stonix

HPL Test

- 10 series test
- 12 containers, 2 VMs
- 4 nodes
- 316 data points

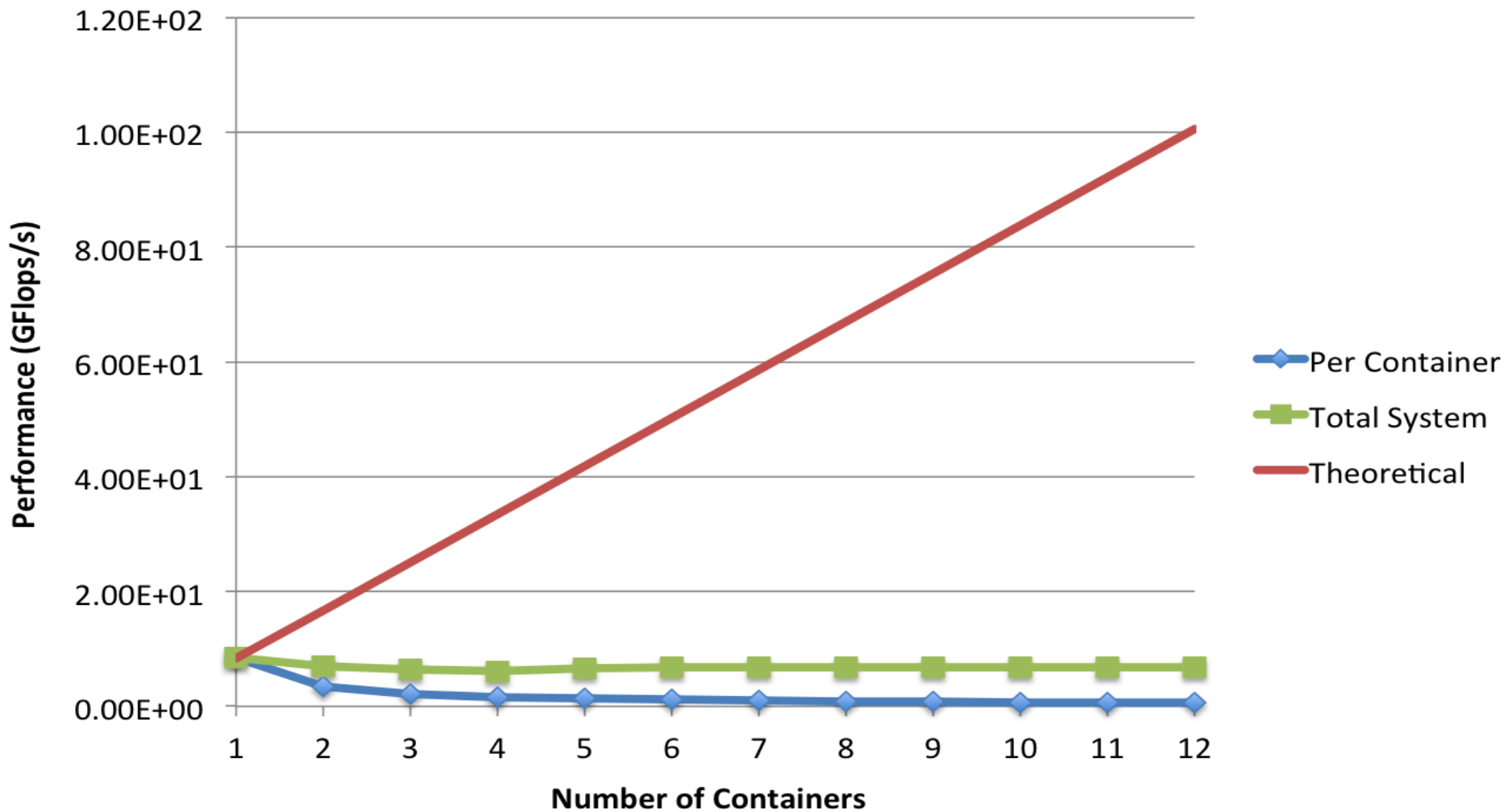
HPL Test Results

HPL Throughput (2 Cores)



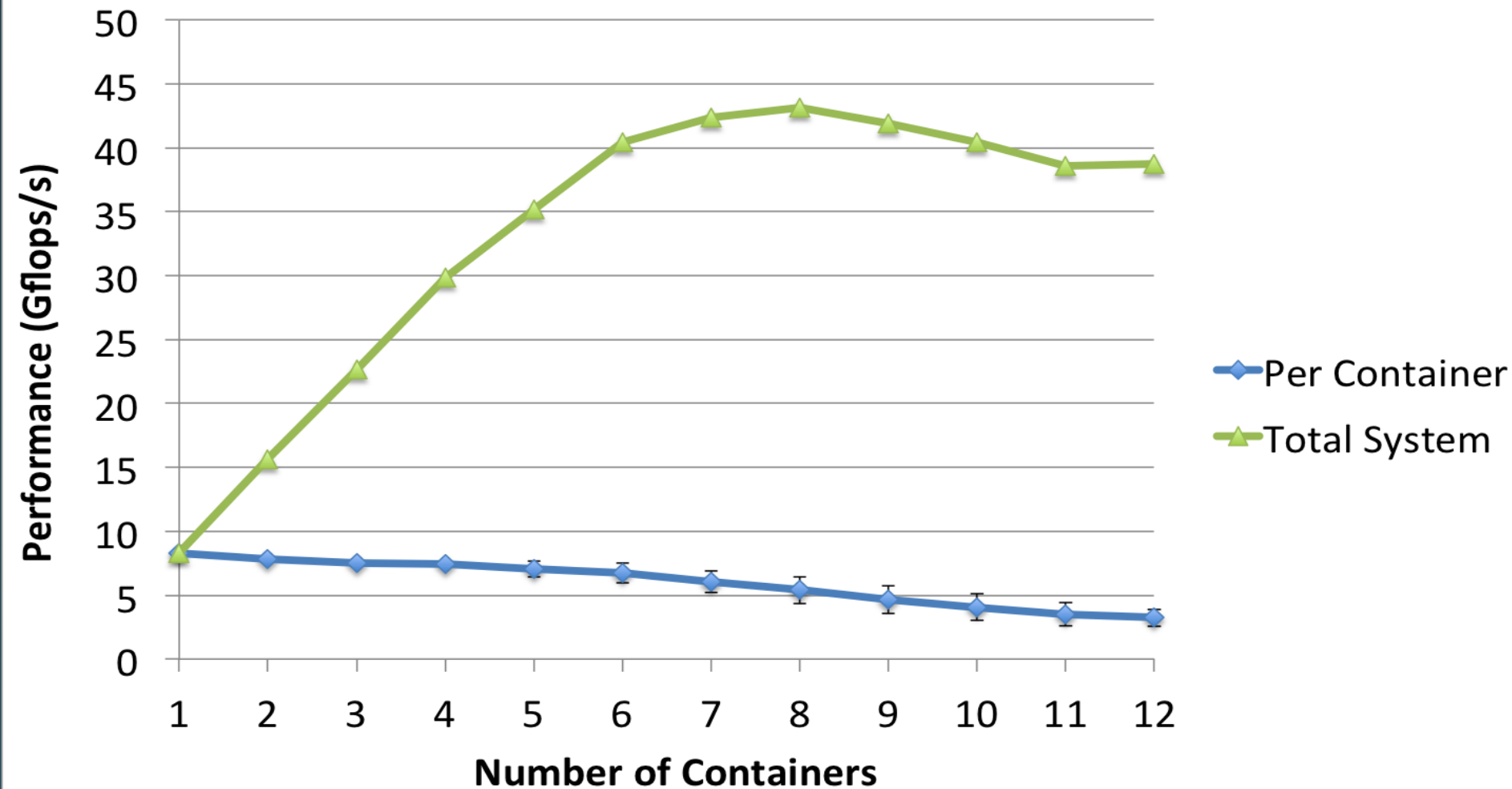
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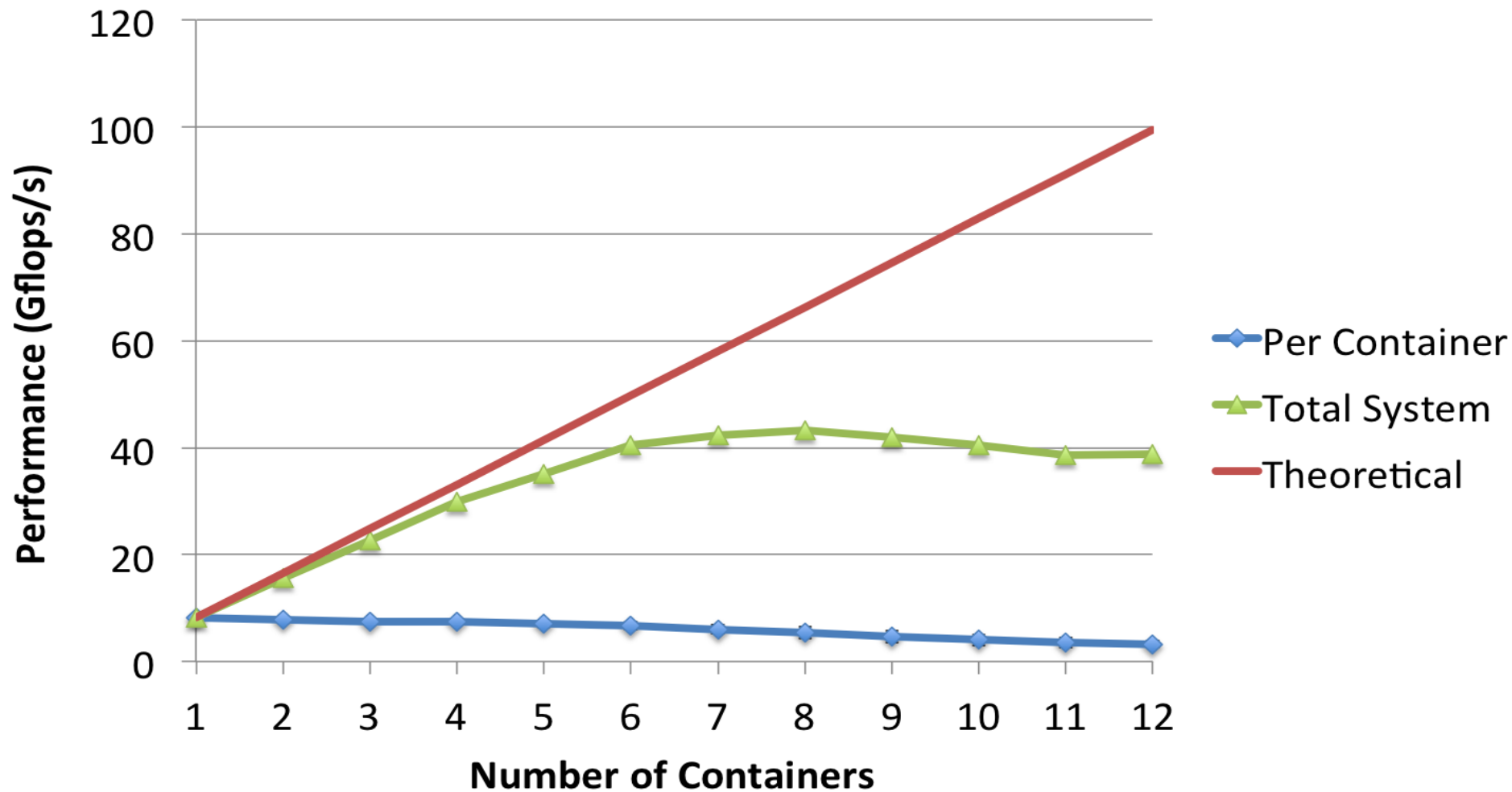
HPL Test Results

HPL Throughput (2 Cores, Assigned)



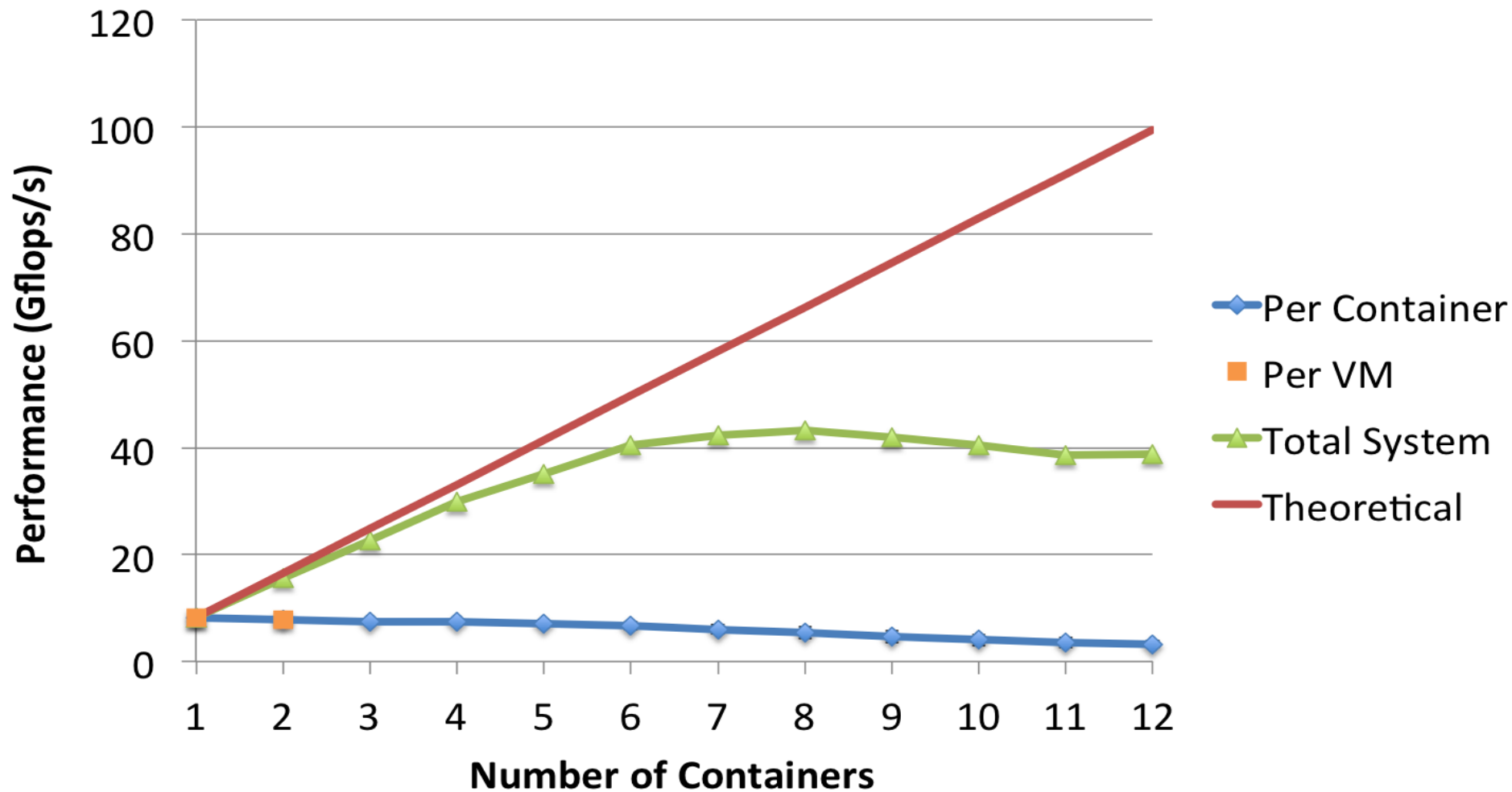
HPL Test Results

HPL Throughput (2 Cores, Assigned)



HPL Test Results

HPL Throughput (2 Cores, Assigned)

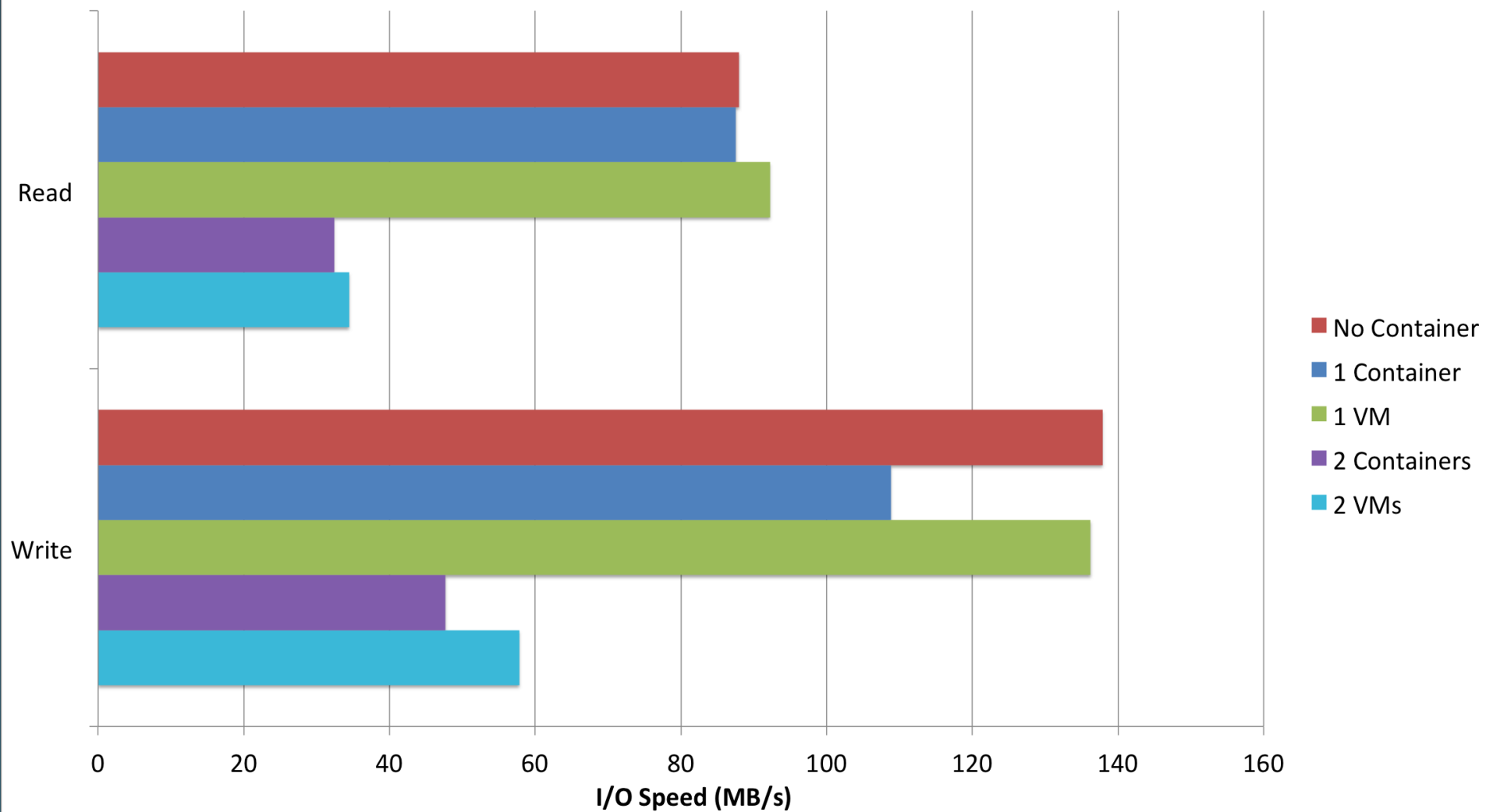


IOR (File IO) Tests

- 10 set series
- 2 cores per test
- 2 containers/VMs
- 70 data points
- ext4

IOR Results

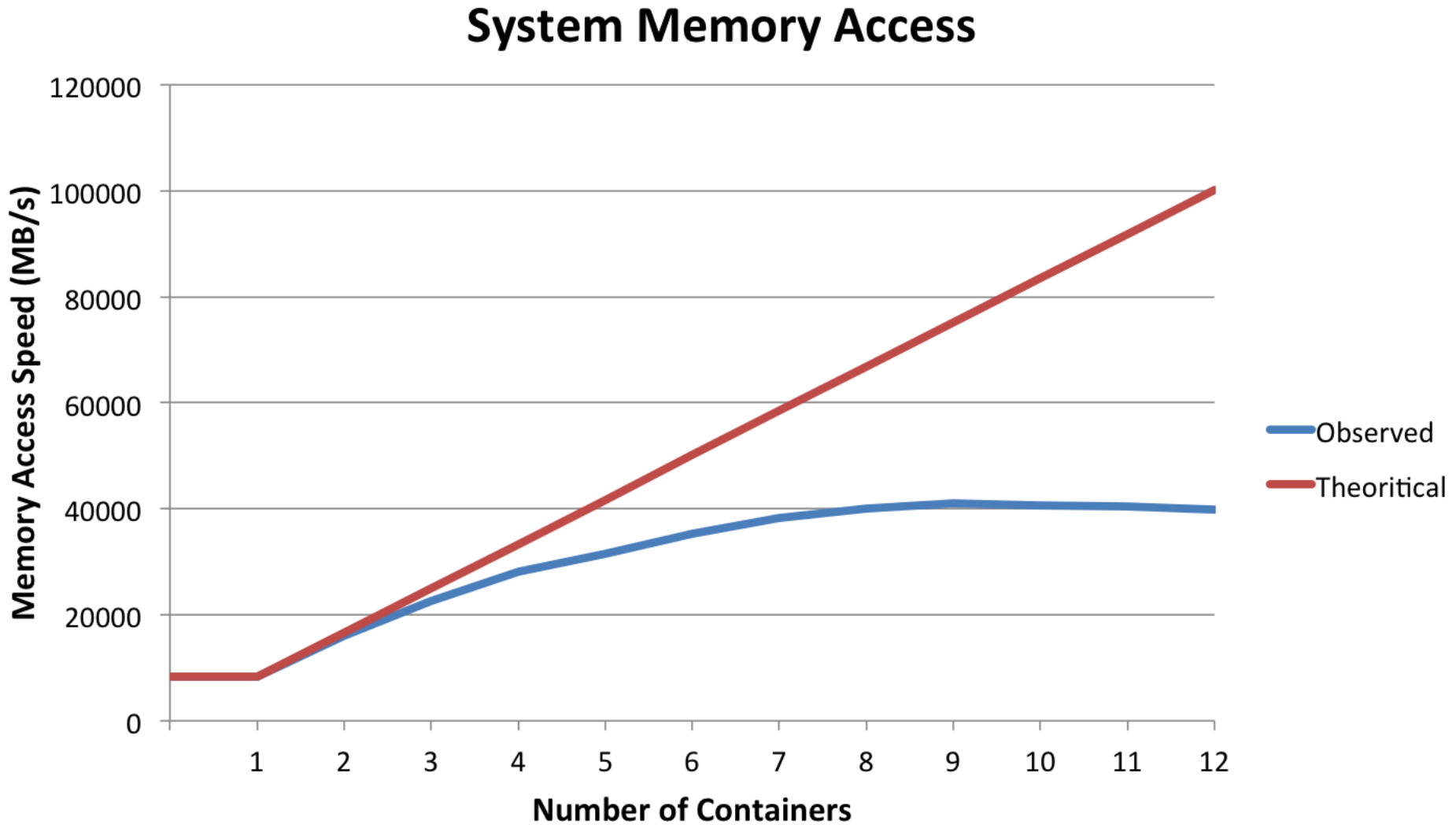
File I/O Speed



Stream (Memory Access) Test

- 50 set series
- 2 cores per test
- 12 containers
- 2 nodes
- 158 data points

Stream (Memory Access) Results



Containers vs VMs

	Docker	VMs
Pros	<ul style="list-style-type: none">▪ Free▪ Open Source▪ Lightweight▪ Easily Portable▪ Lots of Potential	<ul style="list-style-type: none">▪ Established Technology▪ Increased Isolation
Cons	<ul style="list-style-type: none">▪ Kernel exposure	<ul style="list-style-type: none">▪ Software Cost▪ Overhead

Conclusion

- Performance
- Huge potential
- Keep an eye on it!

Future Work

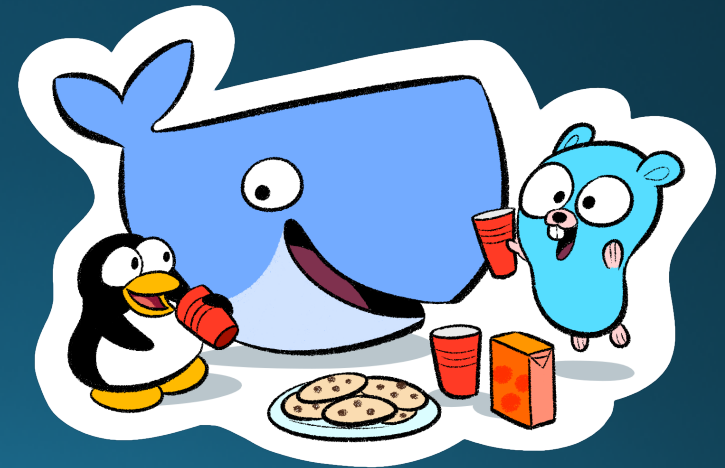
- More VM testing (up to 12)
- More reliable benchmarks
- Security testing

Acknowledgments

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 - David Kennel
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 - Matthew Broomfield
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- CSCNSI Administration
 - Andree Jacobson
 - Carolyn Connor
 - Gary Grider
 - Josephine Olivas

Questions

- Docker overview
- Exploring Docker features
- Security & maintenance
- Benchmarking
 - CPU
 - File IO
 - Memory Access
- Docker containers & VMs



<https://docs.docker.com/images/docker-friends.png>