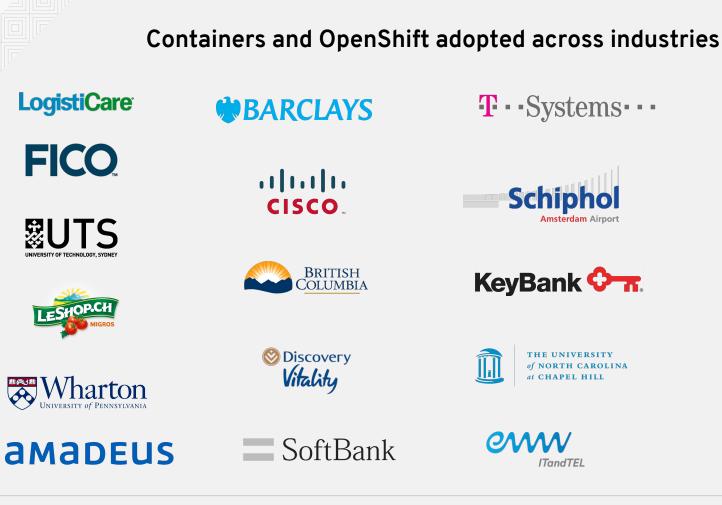
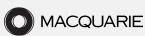


The Path to Cloud-Native Trading Platforms

STAC Spring 2018 Summit NYC Jeremy Eder, Red Hat Performance Engineering





Lenovo

EdLogics

PVM, Inc. IT Consulting

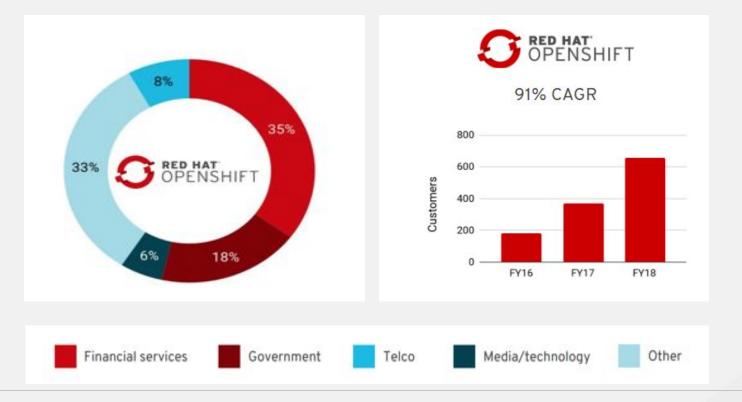
Pioneer

AIXCapital



OPENSHIFT IS GAINING MOMENTUM

OPENSHIFT CUSTOMER GROWTH IS ACCELERATING





Banking on OpenShift Panel - FINOS

The Fl		nity	BRY MELLON MIC CITADEL CIT CREDIT SUISSE
FINOS	By The Numbers	PLATINUM	Gittlub Goldman Sachs Morgan Stanley NOMURA Redhat SYMPHONY
~60	Open Source Repos		&UBS
300+	Contributors	GOLD MEMBERS	INS Markit # IPRE0 openfin S&P Global Tradeweb
8	Collaborative Programs		ARCONTECH (BANKEX Chart IQ
30	Member Organizations	SILVER	FACTSET Patient/Sudice Concentry NODESOURCE
See all our OSS	Projects at <u>finos github.io</u> , our C	ontributors at <u>met</u>	rics.finos.org and Members at finos.org/members
INOS			



- Highlighting the recently announced <u>FINOS community</u> that is using OpenShift to run the online developer environment
- BNZ SMB customers were taking 6hrs to set up loan accounts. Developers had bad tooling. Quarterly releases with limited trust in the process. Needed a platform that could manage the velocity of change. OpenShift took them from 1 release/month to 3 releases/week. 10,000 pods in production.
- Santander 133 projects in production on OpenShift
- Nordea "largest transformation in banking in Europe at the moment" - moving Core Banking to OpenShift - working closely with Temenos and Accenture

View the <u>Banking on OpenShift Panel OpenShift Commons Gathering</u> video.



OPENSHIFT + CoreOS UNIFIED PLATFORM



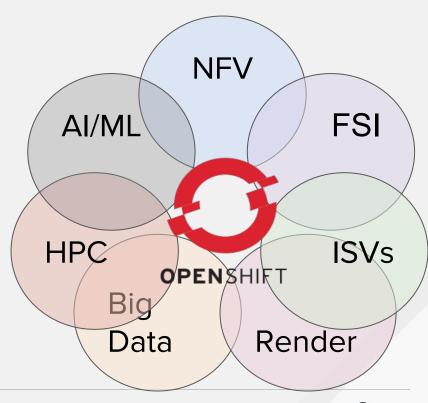
Infra Monitoring	Service Cat/Operat etcd, Prometheus, F Hat Middleware, IS	Red Metering/Cha	Cluster Services Metering/Chargeback, Metrics, Logging, Registry		Developer Productivity Build Automation, Image Streams, CI/CD		
	Operator Lifecycle Manager						
	Automated Operations	Hybrid Cloud	Install / Upgrade		letwork / CNI	App Monitoring	
		Ops & Dev Consoles	oles Security / Auth		Storage / CSI		
	Kubernetes						
	Red Hat Enterprise Linux or Red Hat CoreOS						
Best Operat	or Experience	CaaS 🔶	CaaS 🛶 🔶 PaaS			Best Developer Experience	



Performance-Sensitive Applications

Going beyond generic web hosting workloads

- Identify requirement overlap across verticals
- Plumb enhancements generically
- Allow flexibility





Upstream First: Kubernetes Working Groups

- <u>Resource Management Working Group</u>
 - Features Delivered (all are GA in OCP 3.10)
 - Device Plugins (GPU/Bypass/FPGA)
 - CPU Manager (exclusive cores)
 - Huge Pages Support
 - Extensive <u>Roadmap</u>
- Intel, IBM, Google, NVIDIA, Red Hat, many more...



Upstream First: Kubernetes Working Groups

- <u>Network Plumbing Working Group</u>
 - Formalized Dec 2017
- Implement an out of tree, <u>pseudo-standard</u> collection of CRDs for multiple networks
- Separate control- and data-plane, Fast Data-plane
- IBM, Intel, Red Hat, Huawei, Cisco, Tigera...at least.



Progress Report

What has been done in the last year?

- <u>CPU manager</u> (static pinning) GA in 3.10
- HugePages GA in 3.10
- Device Plugins (GPU, etc.) GA in 3.10
- Sysctl support TP in 3.10
- Extended Resources GA in 3.9





Roadmap

Red Hat continues to invest in evolving support

Topic areas

- NUMA
- Co-located device scheduling
- External device monitoring
- Resource API V2





STAC-N1 Project Overview

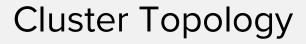
STAC-N1: Bare Metal

- Solarflare XtremeScale X2522 Adapters
- Supermicro SYS-1029UX-LL1-S16
 Servers
- Red Hat Enterprise Linux 7.5

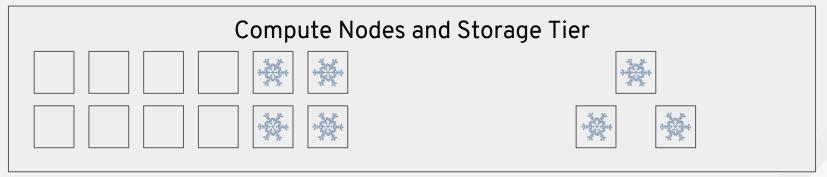
STAC-N1: Containerized/Kubernetes

- Solarflare XtremeScale X2522 Adapters
- Supermicro SYS-1029UX-LL1-S16 Servers
- Red Hat Enterprise Linux 7.5
- Red Hat OpenShift 3.10 (pre-release)



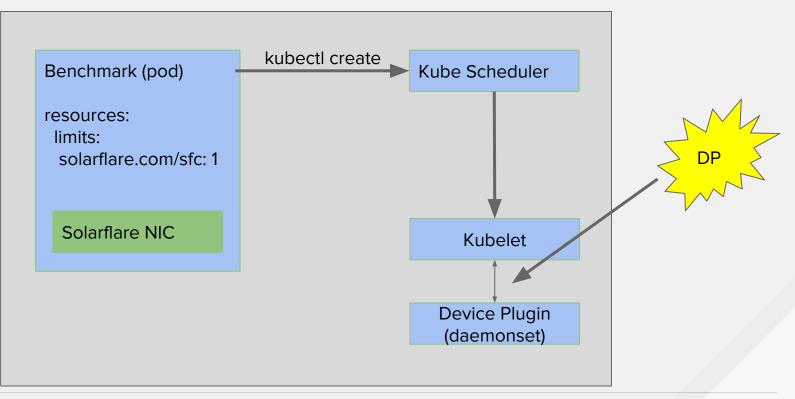






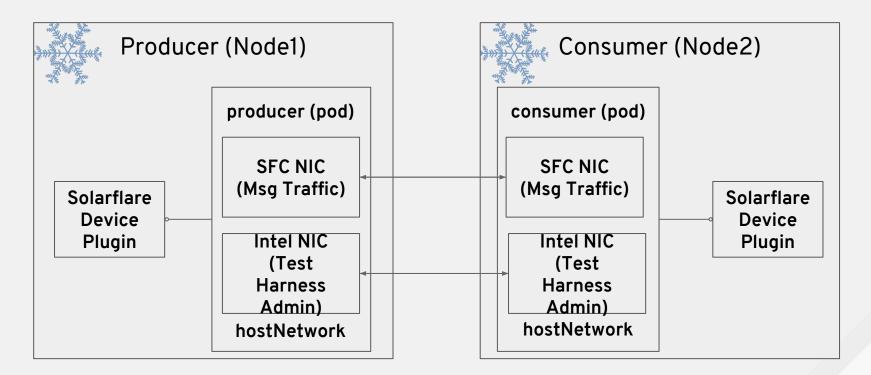


OpenShift Deployment for STAC-N1





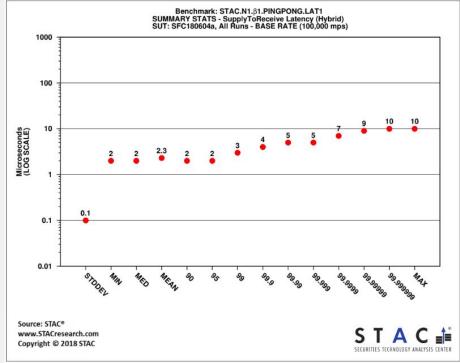
Containerized STAC-N1 Benchmark





STAC-N1 Bare Metal Benchmark SUT: SFC180604a

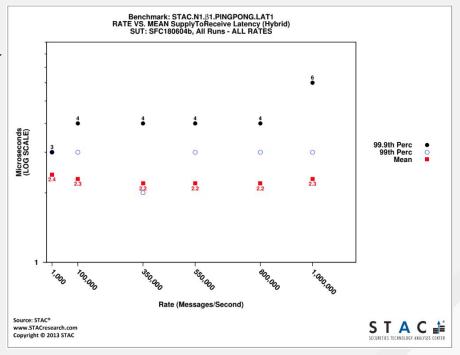
- Lowest mean latency (2.3us) for 264-byte messages at both the base rate of 100K messages per second and the highest rate tested of 1 million messages per second.
- Max latency at 100K messages per second was the lowest of any system using sockets (10us)





STAC-N1 OpenShift Benchmark SUT: SFC180604b

 Mean and 99th percentile latency were the same as bare metal @ 100k and 1M/s rate





Interesting in learning more?



PRODUCTS V LEARN V COMMUNITY V

The Path to Cloud-Native Trading Platforms

JUNE 13, 2018 BY JEREMY EDER

The Red Hat Performance Team, along with our partners Solarflare and Supermicro, have been working together to leverage the latest technologies and features in the container orchestration space to demonstrate that it is possible to containerize extreme low-latency applications without any degradation in performance. The team used the well-known STAC-N1[™] benchmark from STAC® (the Securities Technology Analysis Center), to prove out the technology.

STAC-N1 is a financial services-focused benchmark which focuses on how quickly applications in the trade flow (algorithmic "black boxes", matching engines, smart order routers, etc.) can get information from and to the network. The STAC-N1 benchmark suite measures the performance of network stacks under a simulated market data environment using a convenient, software-only test harness.



https://blog.openshift.com/the-path-to-cloud-native-trading-platforms

Kubernetes Deployment for STAC-A2



- CUDA 9
- 8 x NVIDIA Tesla V100 (Volta) GPUs
- HPE Apollo 6500 w/XL270d Gen9
- Red Hat Enterprise Linux 7.4
- Kubernetes 1.8 (setup info)
- nvidia-smi

--applications-clocks=877,1380

- All-in-One Kubernetes Installation
- (hack/local-up-cluster.sh)
- Node labeled
- Containers:
 - RHEL7+CUDA9
 - RHEL7+CUDA9+-DEVICE-PLUGIN
 - RHEL7+CUDA9+STAC-A2
- <u>https://rhelblog.redhat.com/2017/11/21/red-hat-and-partners-deliver-new-performance-records-on-prominent-risk-analytics-benchmark/</u>
- <u>https://news.developer.nvidia.com/a-new-stac-a2-record/</u>

