

# **Ohio Supercomputer Center**

An **OH**·**TECH** Consortium Member

## **OSC** Perspective

December 4, 2014









## Pankaj Shah, Executive Director, OSC and OARnet OSC Vision and Strategy





## **OSC** Vision - Draft

"A sustainable, regional supercomputer center providing innovative, best-of-class research solutions, technologies and experts to academia, industry and government, giving Ohio a global competitive and economic advantage."



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## OSC Strategy for 2014-15

Emphasis on....

- Clients
- Services
- Partners / Collaborators
- Organization

OSC Priorities...

- HPC system procurement
- Sustainability and Growth
- Research
- National Partners



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## OSC Leadership Team: New / Updated Roles







## Strategy: Condo Models (for Comparison)

- There is a proven business case for consolidation
  - Cost avoidance (eliminating duplication)
  - Value add (higher-quality services)
  - Policy compliance (data centers with high security, D/R)
  - Scalability
- For example, research computing...
  - Initially operates at the laboratory level
  - Then consolidates at university level
- Existing "Condo" models recover costs from researchers
  - Widely adopted e.g., Purdue, Clemson, Cornell, Utah ...
  - Centrally provided core infrastructure and general resources
  - Faculty pay at cost, or marginal cost, for "owner" hardware resources
    - Startup packages, proposals, overhead
  - Extended staff support through inclusion of partial FTE on grants.



## OSC Sustainability

- OSC's support is not keeping up with its demands
  - OSC's support comes predominantly from the state
  - But OSC's demand comes from universities and industry
  - When demand outstrips support, services suffer
- We are working on a model where
  - Institutions and researchers can partner with OSC
    - Condo leasing for compute and storage
    - Contributions for software licenses
    - Including OSC extended support in proposals
  - Industry can partner with OSC
    - Condo ownership and/or fee for service





## Proposed Condo Model for New Cluster (2015-16)



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## Ruby Condo Pilot Augments Capacity



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David Hudak, Director of Supercomputer Services
OSC Updates

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## Research Impact 2013-14

- Production Capacity
  - 82+ million CPU core-hours delivered
    - Over <u>3.3 million jobs</u>
  - 835 TB data storage space in use
  - 98% uptime (target: 96% cumulative uptime)
- Client Service Facts
  - **<u>24 universities</u>** served around the state
  - <u>194 new projects</u> awarded to Ohio faculty
  - 948 individuals ran a computing simulation or analysis
  - <u>330+ individuals</u> attended <u>18 training opportunities</u>





2013-14 Active **Projects by** Institution



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## 2013-14 Computing Usage by Field of Science (FoS)





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## Priorities for 2014-15

#### HPC and Storage Acquisitions

- Goal: \$12M HPC acquisition to put Ohio in • top 10 academic systems nationally
- Actively seeking partners to co-invest
- Proposed timeline:
  - RFP Release January 2015
  - RFP Responses March 2014
  - Vendor Selection Late March
  - Complete Procurement Spring/Summer
  - Delivery Late Summer
  - Production Operation Fall

#### **Research Support**

- Increase research impact through targeted collaborations
- Using reserves up to \$250K over 3 years to explore joint appointments with OSU, UC and CWRU
- Research and Innovation Center on hold ongoing efforts for research portal. However more communication needs to be done with UC and CWRU

### Sustainability and Growth

- Improve client portfolio
- Strengthen connections with largest clients
- Extend connections to new markets (by academic discipline, institution or research group)
- **Diversify funding**
- Continued organizational restructuring
- Process improvements (NOC, ServiceNow)

#### **National Partnerships**

- Academic HPC community (e.g., XSEDE, ACI-REF, individual centers)
- Industrial modeling and simulation market (AweSim and it's related ventures)
- Collaborate on national grants with other centers - e.g. Buffalo, NY, Clemson, SC and Utah
- Provide HPC cycles and storage as Net+ ٠ services through Internet2



## **OSC Projects for FY15**

HPC	Growth	National
Ruby deployment	Password reset	AweSim
Cluster RFP	Service Desk	Service Catalog
Cluster defaults	ServiceNow	OpenFoam/Kepler
Ethernet upgrade	Auto-Build evaluation	HP Helion Cloud
Storage upgrade	MyOSC	
Infrastructure upgrades		
New cluster deployment		



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## **OSC Internal Restructuring**

- SCS provides production services to OSC clients
  - Bring technical teams under common leadership (Dave, Doug, Brian, Karen and Basil)
- Comprised of four groups:

<u>HPC Systems</u>	<u>HPC Client Services</u>
"Large-scale HPC production	"Outreach, engagement,
environment – infrastructure, compute	administrative services and technical
and storage"	services"
<u>Scientific Applications</u>	Web and Interface Applications
"Application-level software on OSC	"OSC OnDemand, AweSim apps and
clusters, HPC programming and	HPC apps for web and mobile
domain science expertise"	platforms"





## **OSC System Naming Contest**

- Contest to name 2015 system
  - Contest launched at SC14
  - Inviting user community today: www.osc.edu/hpc\_name
  - Concludes at Ohio Educational Tech Conference (Feb)
- Contest to provide leadership with Top 10 suggestions
- Name submissions should:
  - Reflect a strong connection to the State of Ohio
  - Communicate a positive, innovative and pioneering spirit
  - Be easily pronounced and understood
  - Be one-of-a-kind









Doug Johnson, Chief Systems Architect and HPC Systems Manager OSC Services

www.osc.edu



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## **Ruby\*** Cluster

- In Early User testing now
- Small size: 240 nodes (about 1/3 size of Oakley)
- Big impact: 144 TF (Oakley is 154 TF, Glenn 60TF)
- Expanded accelerator development (GPU, Xeon Phi)
- \$1.6M purchase; 1/3 funded by condo owners



\*Ruby Dee was an actress, poet, playwright, screenwriter, journalist and activist. She was born in Cleveland.



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## Ruby, Oakley & Glenn: System Configurations

	Ruby System (2014)	Oakley System (2012)	Glenn System (Phase II, 2009)
Theoretical Peak Performance	96 TF + 28.6 TF (GPU) <u>+ 20 TF (Xeon Phi)</u> ~144 TF	88.6 TFs <u>+ 65.5 TFs (GPU)</u> ~154 TF	53TFs <u>+ 6 TFs (GPU)</u> ~60 TF
Number of Nodes	240	692	400
Number of CPU Sockets	480	1384	800
Number of CPU Cores	4800	8304	3200
Number / Kind of Accelerators	20 nVidia Tesla K40 20 Xeon Phi 5110p	128 nVidia M2070s	18 nVidia Quadro Plex 2000 S4's
Total Memory	~15.3 TB	~33.4 TB	~9.4 TB
Memory per Node	64 GB	48 GB	24 GB
Memory per Core	3.2 GB	4 GB	3 GB
Interconnect	FDR/EN IB	QDR IB	DDR IB





## C15, Ruby, & Oakley: System Configurations

	C15 System (2015)	Ruby System (2014)	Oakley System (2012)
Theoretical Peak Performance	~1000 TF	96 TF + 28.6 TF (GPU) <u>+ 20 TF (Xeon Phi)</u> ~144 TF	88.6 TFs <u>+ 65.5 TFs (GPU)</u> ~154 TF
# Nodes	~1000	240	692
# CPU Sockets	~2000	480	1384
# CPU Cores	~24000	4800	8304
# / Kind of Accelerators	TBD	20 nVidia Tesla K40 20 Xeon Phi 5110p	128 nVidia M2070s
Total Memory	>100 TB	~15.3 TB	~33.4 TB
Memory per Node	128 GB	64 GB	48 GB
Memory per Core	~4 GB	3.2 GB	4 GB
Interconnect	EDR IB	FDR/EN IB	QDR IB





## **FY15 Machine Acquisition**

- Timeline
  - Issue RFP, 2 month response time
  - Select vendor, 2-3 weeks
  - Complete procurement, 3 months
  - Vendor delivery, 1-2 months
  - Deployment, 2 months



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## FY15 Machine Acquisition

	Current	Upgrade description
Ethernet network	10Gb connections to OARnet and OSU	40Gb connections to OARnet and OSU, 10Gb redundant circuit
Tape library	~3 PB, ~1 GB/s throughput	~6 PB, ~2 GB/s throughput, user accessible archive
GPFS "project" storage	1.1 PB, ~5 GB/s throughput	~5 PB, 30-60 GB/s throughput
Home directories	~300 TB, ~2-3 GB/s	~0.5 PB, ~10 GB/s

- Related projects
  - Facility preparations (power, cooling, space)
  - Infrastructure servers (VM servers, monitoring, DNS, etc)



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## Questions

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