

NWSC-2: NCAR's Next Generation Procurement

Computational & Information Systems Laboratory
CISL



SC14

New Orleans, LA | hpc matters.

November 16-21, 2014



Disclaimers

Nothing in the Request for Information (RFI) or this presentation should be construed as a Request for Proposal (RFP) and no offers are to be submitted at this time.

UCAR reserves the right to discontinue plans to procure the NWSC-2 Computing Platform with no responsibility to interested parties. UCAR will not be responsible for costs incurred by companies that respond to this RFI or to any subsequent RFP, and will not reimburse companies for such costs.

Outline of Talk

- Strategic Objectives and Procurement Highlights
- NCAR user community and current computing environment
- Yellowstone Workload Study
- Schedule
- Outline of the Draft Technical Specification
 - Base system performance
 - Technical Options
 - Benchmarking
- Request for feedback
- Q&A and other sources of information

NWSC-2 Strategic Objectives

1. Provide a highly productive, data-intensive HPC resource for NCAR users and applications that builds on the design and success of the Yellowstone computing complex
2. Ensure that users remain productive throughout the transition to NWSC-2, and beyond
3. Invest in new architectures and technologies that are anticipated to be prevalent in systems in the next 5-10 years
4. Enable application optimization and refactoring efforts required to make use of these technologies

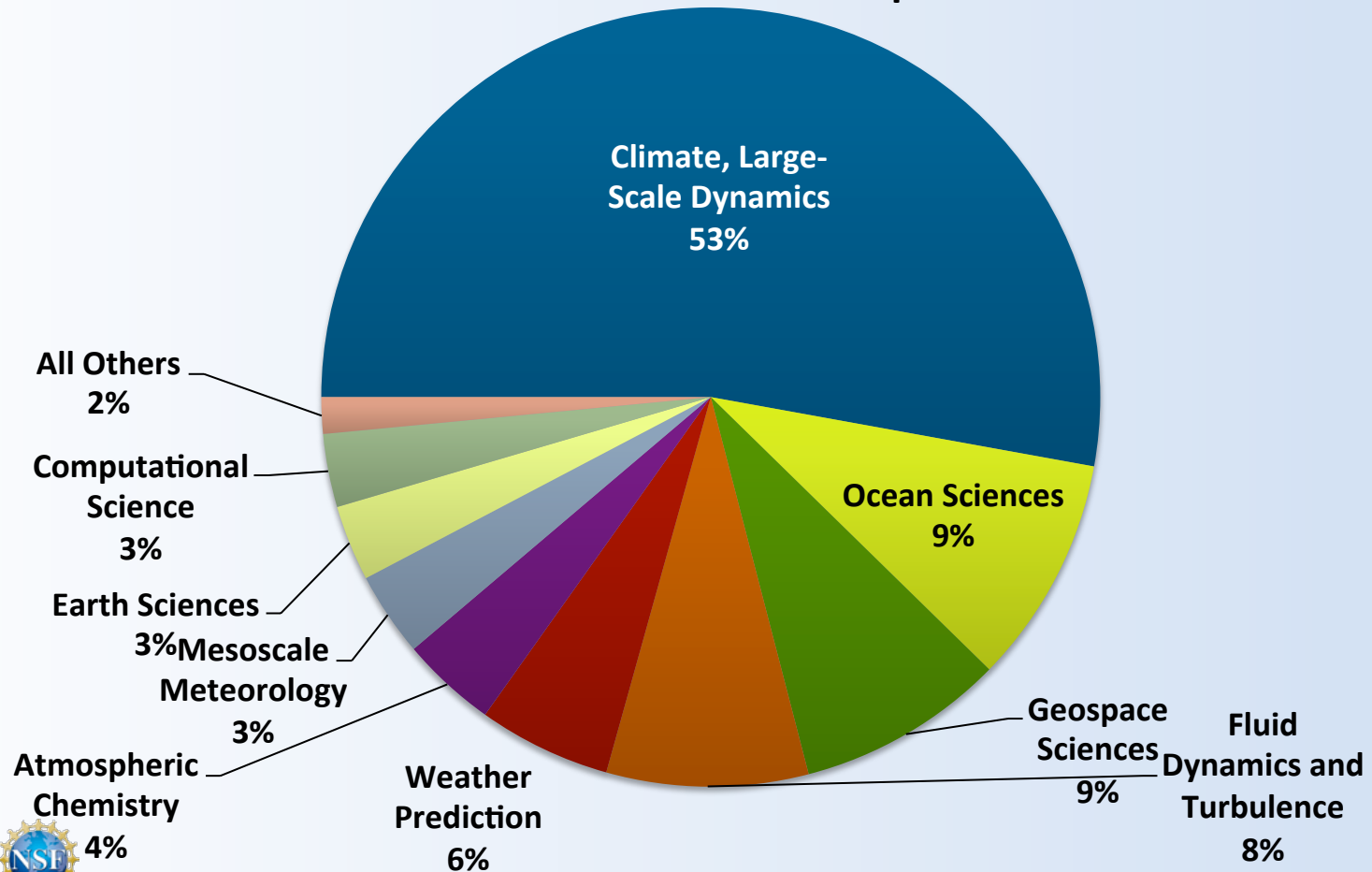
NWSC-2 Highlights

1. Deploy a highly efficient, usable, and reliable HPC resource that achieves 2-5x the performance of Yellowstone
2. Deploy a high performance storage and parallel file system that achieves a FLOPS/BYTE ratio of 250.
3. Integrate with NCAR's existing high-performance, GPFS-based storage system
4. Enable the transition to future architectures by providing capability that new processors, storage technologies, and software
5. Provide flexible technical options, including: many-core nodes; GPGPU nodes; DAV nodes; storage expansion; innovative storage and memory technologies; future expansions of HPC system and storage; maintenance.
6. Deploy the system in 2H-2016 for a production availability of January 1, 2017
7. Estimated funding \$30M available through a Best Value procurement
8. Deploy the systems at the NCAR-Wyoming Supercomputer Center in Cheyenne, WY

NCAR User Community

Over 1000 users, and 200 applications from the Atmospheric and Related Sciences

Yellowstone use since start of production



Current Computing Environment (1)

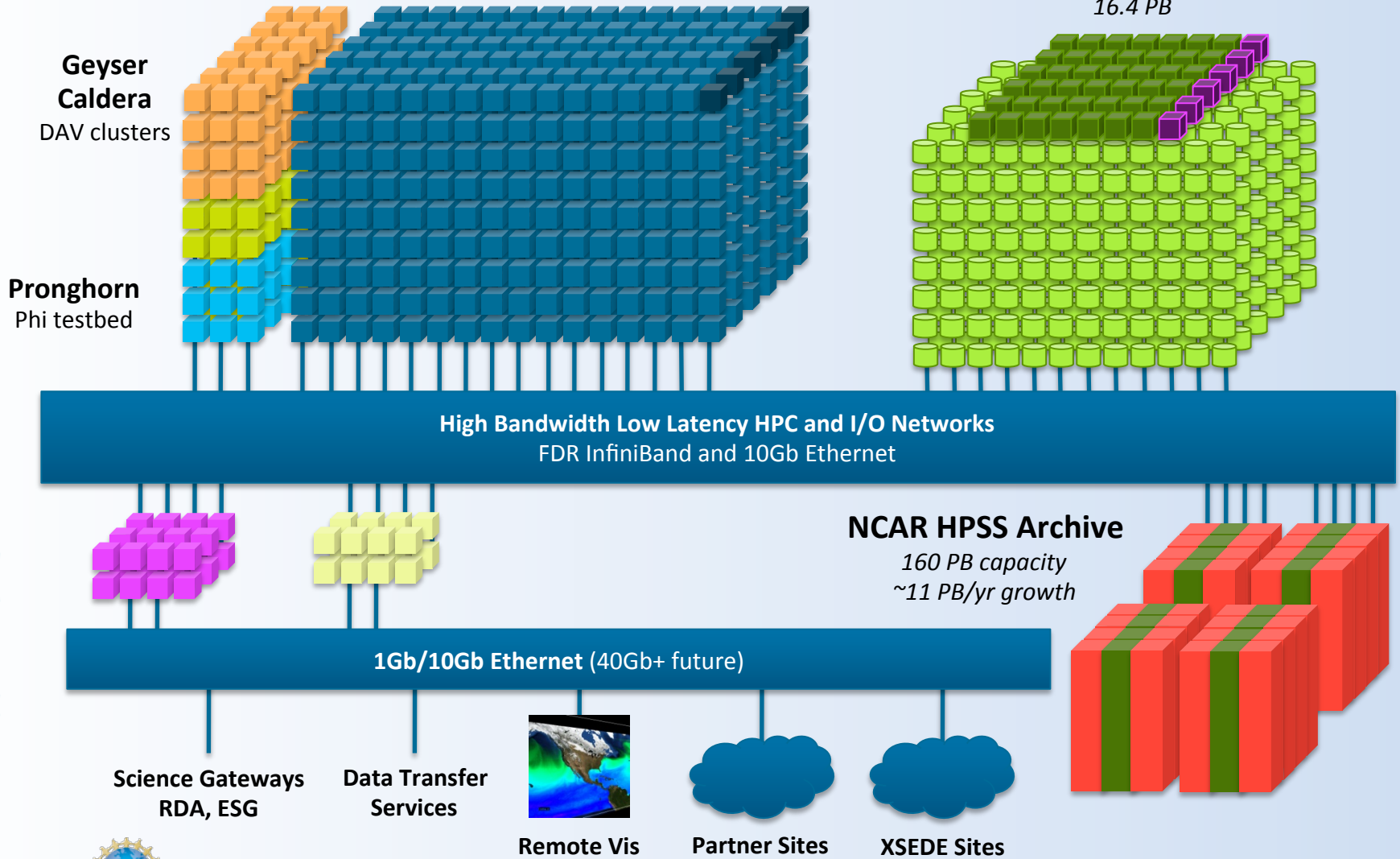
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Yellowstone

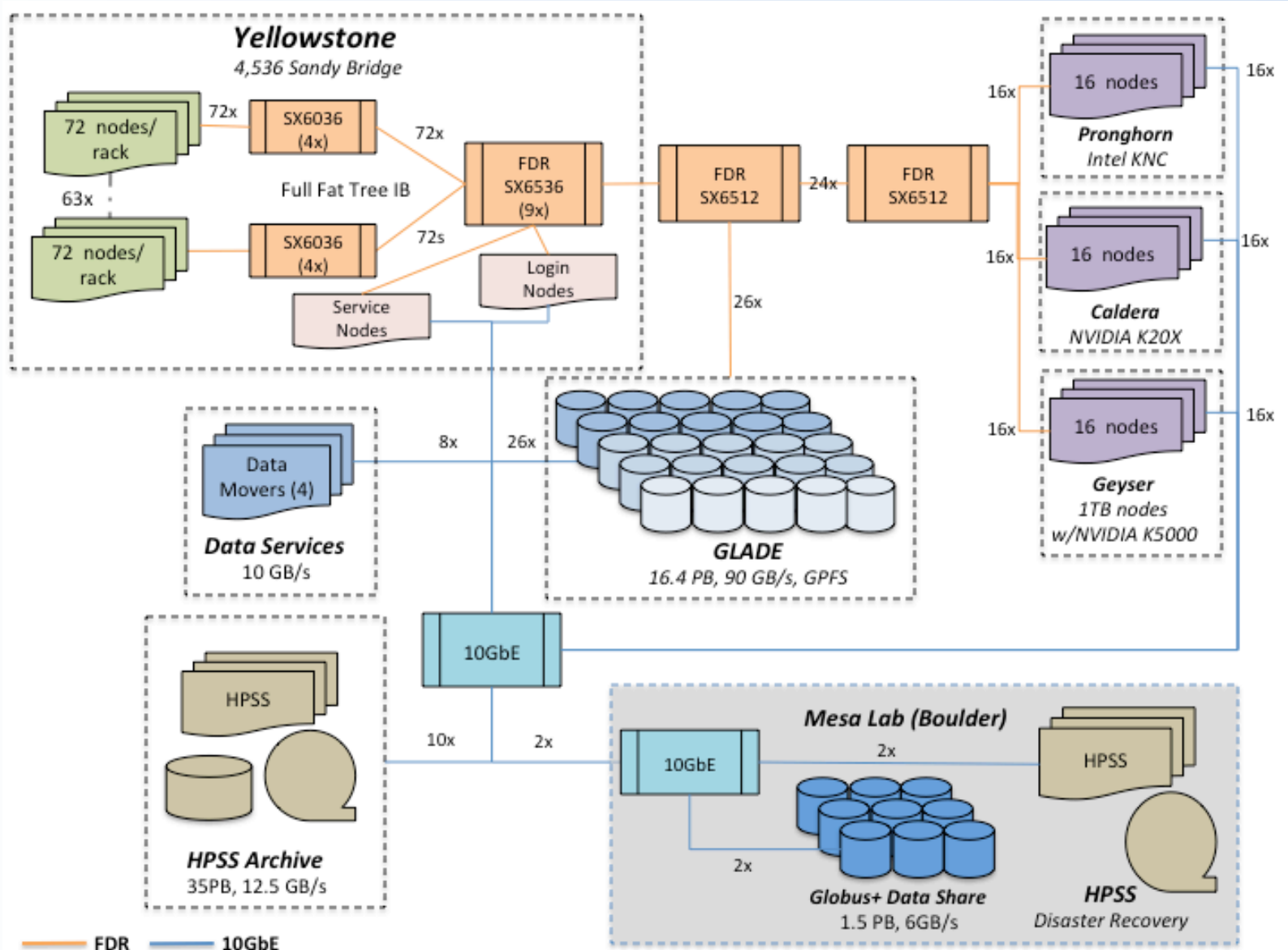
HPC resource, 1.5 PFLOPS peak

GLADE

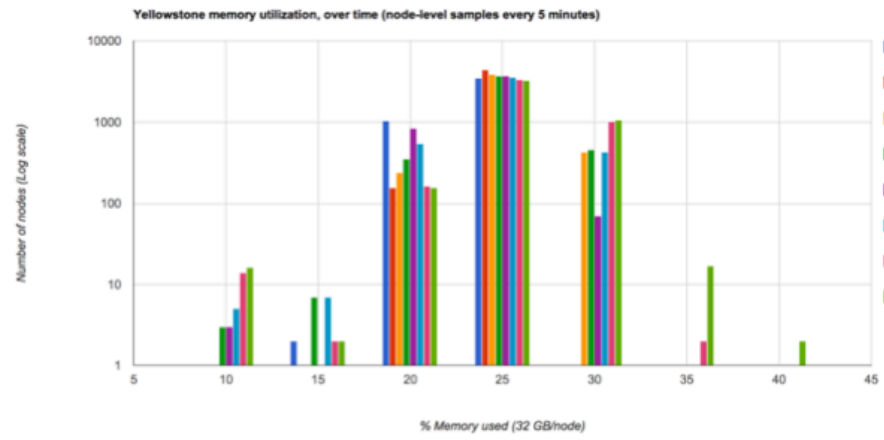
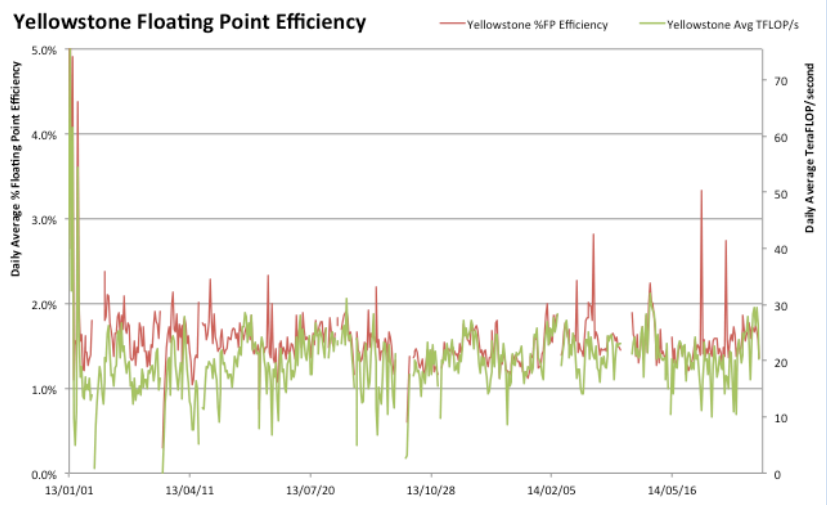
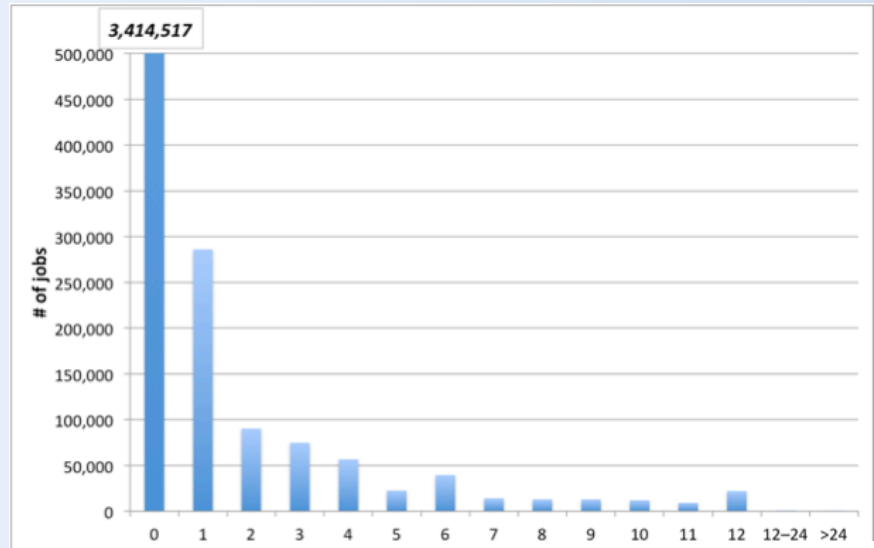
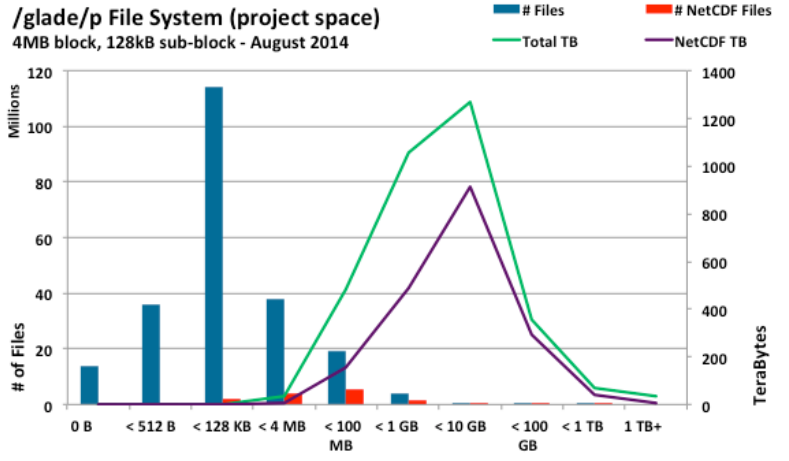
Central disk resource
16.4 PB



Current Computing Environment (2)



Yellowstone Workload Study Gives Insights into NCAR's Current Workload



NWSC-2 Schedule

Subject to change

- **October 20, 2014:** Released Draft Technical Specification (DTS) and Yellowstone workload study
- **December 19, 2014:** Feedback on DTS due
- **January 31, 2015:** Benchmarking files and instructions available
- **April 1, 2015:** Formal Request for Proposals available
- **May 1, 2015:** Proposals due
- **2H-2015:** Vendor selection, negotiation, NSF approval
- **2H-2016:** Equipment delivery, acceptance, friendly-user
- **January 1, 2017:** Production
- **December 2017:** Decommission Yellowstone

Outline of the DTS

Section	Description	# Pages
1.0 Introduction	Objectives and scope, schedule, funding	2
2.0 Mandatory Elements of Offeror Response	Elements to be included in subsection responses	.5
3.0 Target Design Requirements	Detailed system design and performance requirements	19
4.0 Technical Options	Options include: technology additions to base system; capacity expansions; maintenance options	9.5
5.0 Delivery and Acceptance Requirements	Summary of pre-delivery, site integration, and acceptance testing phases	1
6.0 Risk Management and Project Management	High-level overview of requirements for risk and project management	.75
7.0 Documentation and Training	Document and training requirements	1
8.0 References	References	.25
Figures	Current NCAR HPC environment; electrical and mechanical overview of NWSC	2
Appendix A: Sample Acceptance Plan	Sample Acceptance Plan with elaboration of testing phases	6
Appendix B: Project Management Requirements	Detailed requirements for program and risk management	6.5
Definitions and Glossary	Definitions and Glossary	1

Base System Performance

Performance Metric	NWSC-2
NCAR Benchmarking Suite (NBS) sustained performance increase over Yellowstone system	2-5x
Capability Improvement, using elements of NBS	2-5x
Minimum memory on a compute node. This metric is for main memory capacity only, e.g. DDR4. It does NOT include memory associated with caches, accelerators, scratch pads, etc.	64 GB
Disk Capacity of the system's parallel file system	20 PB
FLOPS/BYTE used to determined the bandwidth of the system's parallel file system	250 FLOPS/BYTE
Aggregate external bandwidth on/off the system for general TCP/IP connectivity	20 GB/s
External bandwidth on/off the PFS for access by other systems (e.g., existing Yellowstone)	100 GB/s
Aggregate external bandwidth on/off the system for accessing NCAR's external, GLADE file system (GPFS)	100 GB/s
Aggregate external bandwidth on/off the system for accessing external NCAR archive (HPSS)	12 GB/s

Technical Options

Technical Option	Guidance
§4.1 Many-core partition	Development work may be required. In proposing a delivery date for the many-core component, Offeror should consider market maturity, reliability, and programming model, among other criteria.
§4.2 General Purpose GPU	General market availability of the GPGPU is assumed. If exercised, some quantity is expected at initial system delivery. Subsequent quantities are possible.
§4.3 Parallel File System	Upgrade to performance and/or capacity of PFS. Specific quantities and delivery date will be negotiated at award. Subsequent quantities are possible.
§4.4 Visualization, Data Analysis and Post Processing	General market availability assumed. If exercised, some quantity is expected at initial system delivery. Subsequent quantities are possible.
§4.5 Software Tools and Programming Environment	General market availability assumed. Tools that are part of Technical Options that require development may be deployed with corresponding technology.
§4.6 Early Access System	Minimum configuration for NCAR Simulation Suite due 6-months prior to initial system delivery. Other configurations will be negotiated as part of specific technical options that are exercised.
§4.7 Innovative Storage and Memory Technologies	Development work may be required. Offeror should propose a delivery date consistent with general market availability.
§4.8 Maintenance, Support, and Technical Services	Enhanced services beyond the base §3.13 services. Offeror should propose incremental enhancements, if applicable, as described.

Benchmarking Elements

- Target sustained performance of 2x-5x increase over the Yellowstone platform using the NCAR Benchmarking Suite (NBS): NBS is a suite of compact application kernels designed to reflect the NCAR workload. Result to be submitted with proposal.
 - *The Offeror's proposal shall state a minimum Sustained Performance as measured by the geometric mean of the NBS constituent applications.*
- The system shall achieve, at acceptance, on average, a 2x-5x Capability Improvement over the Yellowstone platform. Codes for Capability Improvement are a subset NBS.
 - *Capability Improvement is defined as the product of an increase in problem size and an application-specific runtime speedup factor. For example, if the problem size is 4 times larger and the runtime speedup is 1.25, the capability improvement is 5x*

Your feedback is critical

Feedback on the DTS should be submitted by 4PM, MDT on December 19, 2014 per the instructions in the **Letter to Interested Parties**.

- should focus on the clarity of our Draft Technical Specifications document, functional descriptions, options, available technology, benchmarking approach, schedule, and any other areas you deem to be relevant;
- should provide your rationale for proposed changes or additions to a Technical Specifications Document that would be issued with any RFP;
- will not be shared with others unless they are incorporated into the anticipated RFP;
- may or may not be incorporated into the anticipated RFP.

Sources of Information

- Procurement website:

<https://www2.cisl.ucar.edu/NWSC-2>

- Letter to Interested Parties
- Draft Technical Specification
- Yellowstone Workload Study
- NWSC Science Justification

- CISL website

<https://www2.cisl.ucar.edu/>

Thank you!

Questions?