REQUEST FOR PROPOSAL (RFP)

Title:	**High Performance Compute Cluster**
RFP #:	AK1-SMU-HPC2022
Date Issued:	Monday, January 3, 2022
DUE DATE:	February 18, 2022
RFP Issued By:	Abby Kinney, IT Category Manager SMU Purchasing

Section 1 – General Information / Purpose / Overview

1.1 Background

As a private, comprehensive university enriched by its United Methodist heritage and partnership with the Dallas-Fort Worth area, SMU seeks to enhance the intellectual, cultural, technological, ethical, and social development of a diverse student body. SMU offers undergraduate programs centered on the liberal arts and provides excellent graduate, professional and continuing education programs. The SMU experience also includes accessible faculty in small classes and abundant opportunities for research experience, international study, leadership development, and service and internship opportunities beyond campus – all with the goal of preparing students to become contributing citizens and leaders for our state, nation and world.

SMU has approximately 11,000 students studying in seven degree-granting schools: Cox School of Business, Dedman College of Humanities and Sciences, Meadows School of the Arts, Bobby B. Lyle School of Engineering, Dedman School of Law, Annette Caldwell Simmons School of Education and Human Development, and Perkins School of Theology. The Moody School of Graduate and Advanced Studies offers doctoral and master's degrees in a wide variety of fields across four different colleges and schools: the Dedman College of Humanities and Sciences, the Lyle School of Engineering, the Meadows School of the Arts, and the Simmons School of Education and Human Development

SMU has two campus locations. The main campus in Dallas, Texas includes over 100 buildings sitting on 234 acres approximately five miles north of downtown Dallas. The main campus has grown significantly in recent years with new construction as well as renovated space for instruction and research. SMU-in-Taos is located within the Carson National Forest. In the 13 buildings located on 423 acres outside Taos, courses are offered in the natural and social sciences, humanities, arts and business, as well as archaeological research and field study.

1.2 Purpose

The purpose of this **Request for Proposal (RFP)** is to solicit proposals from qualified suppliers to provide next generation high performance compute cluster to support university research initiatives.

Where the word "Company" or "Companies" is used, it shall be understood to reference the respondent's form of business organization, whether the business is organized in the form of a corporation, partnership, sole proprietorship, or other arrangement. The use of the word "Company" or "Companies" is not intended to restrict competition or indicate any preference. All timely responses submitted from qualified bidders, that meet the requirements of this Request for Proposal, will be considered.

Bidders should read all proposal materials carefully and note the schedule (see Attachment 1).

1.3 RFP Schedule and Proposal Submittal

1.3.1 Proposals and all questions and comments in reference to this RFP must be submitted electronically via email to the *SMU Purchasing Department*. The Purchasing representative is Abby Kinney and her email address is ***akinney@smu.edu***

The ***Subject line*** for all emails ***must have a prefix of: RFP/AK1-SMU-HPC2022***

Proposals must be submitted as stated above and not to any other office or department at the University.

1.3.2 Schedule

Issue Request for Proposal	January 3, 2022
Deadline for Round 1 Questions	January 14, 2022
Deadline for Round 2 Questions	January 28, 2022
Closing Date – 3PM	February 18, 2022
Evaluation and Notice of Selection	Week of April 4

Reference RFP schedule in Attachment 1 for complete details on the timeline.

1.3.3 Proposals must be received by the SMU Purchasing Department within the timeline stated in Attachment 1 to be considered.

Any proposal received after the time specified for the receipt of proposals may not be considered and may be returned unopened.

1.3.4 The bidder assumes sole responsibility for the complete effort required in the RFP. No special consideration shall be given because the bidders failure to be knowledgeable of all of the requirements of this RFP. By submitting a proposal in response to this RFP, the bidder represents that it has satisfied itself, from its own investigation, of all the requirements of this RFP.

1.3.5 SMU reserves the right to accept or reject any or all proposals and to waive any irregularities, technicalities, or informalities in proposals if such waiver does

not substantially change the offer or provide a competitive advantage to any Company. SMU reserves the right to request additional documents or proposal clarifications after the due date and time for proposal submission.

1.3.6 SMU assumes no responsibility and bears no liability for costs incurred by the bidder in preparation and submittal of proposals in response to this RFP.

1.3.7 SMU will share the contents of all proposals internally for inspection and discussion by stakeholders and management. Trade secrets or proprietary information that are recognized as such and are protected by law may be withheld if clearly identified as such in the proposal. Proposals marked entirely confidential or proprietary may be rejected. Pricing information and other offers cannot be considered proprietary information.

1.3.8 All opened proposals become the property of SMU and will not be returned to the offeror.

1.3.9 Failure to comply with the requirements of this RFP or evidence of unfair bidding procedures may be cause for rejection of the proposal. Failure to supply information requested may also be cause for rejection of the RFP as being non-responsive.

1.3.10 This Request for Proposal does not commit SMU to make an award, nor will SMU pay any costs incurred in the preparation and submission of proposals, costs incurred in making necessary studies for the preparation of proposals, or any travel or personnel expenses associated with trips to SMU.

1.3.11 Selection process will be based solely on SMU's best interest without explanation or justification to bidders.

1.3.12 SMU reserves the right to award the Preferred Agreement in whole or in part as deemed to be in the best interest of SMU. SMU reserves the right to negotiate with any Company if such action is deemed to be in the best interest of SMU and to request additional documents or proposal clarifications after the due date and time for proposal submission.

1.3.13 If it is determined to be in the best interest of SMU to separate the high-performance storage component from the rest of the elements of the RFP in order to achieve best value, SMU reserves the right to do so.

1.4 Updates to the RFP

In the event that it becomes necessary to clarify or revise this RFP, such interpretations, corrections, revisions, and amendments shall be issued by the SMU Purchasing Department to all known holders of the Bid Documents in the form of written updates transmitted via email.

1.5 Qualification of Company

SMU shall make such investigations as deemed necessary to determine the ability of Company to provide the expected goods or services. SMU reserves the right to reject any bid if the evidence submitted by, or investigation of, such Company fails to satisfy SMU, in its sole opinion, that said Company is properly qualified to carry out the obligations specified herein.

1.6 Joint Bids

Where partners or subcontractors or other arrangements are involved in delivering the solution SMU will hold the Company named as submitting the bid responsible for all deliverables in the Company's bid.

1.7 Master Services Agreement

SMU will require the selected vendor to execute a Master Services Agreement (MSA) that incorporates this RFP, vendor's response and exhibits and a statement of work. A draft MSA is provided as Attachment 11 of this document. Any requested changes to the MSA must be submitted with the RFP response and will be included as a part of the evaluation process.

1.8 Other Schedule and Pricing Issues

While SMU intends to stay on schedule with the RFP, it is also SMU's desire to include the latest technology refresh where possible. SMU is asking for proposals that account for the scheduling challenges and provide not- to-exceed pricing for each component if firm pricing is not available. Please see the appropriate sections for more details.

1.9 Payment Milestones for Hardware Provider Company(s)

Payment Milestone 1 (35%) is achieved when all hardware is delivered, installed, cabled and firmware updated to most current version.

Payment Milestone 2 (35%) is achieved when Software Installation and Start-up Services work (reference attachment 7) is complete.

Payment Milestone 3 (30%) is achieved when all punch list items from milestone 1 and 2 are complete and Benchmark Jobs and Acceptance Testing (Reference attachment 8) is complete.

1.10 Payment Milestones for Services Engagement

Payment Milestone 1 (35%) achieved when Software Installation and Start-up Services work (reference attachment 7) is complete.

Payment Milestone 2 (35%) achieved when Benchmark Jobs and Acceptance Testing (per attachment 8) is complete.

Payment Milestone 3 (30%) achieved when all punch list items from milestone 1 and/or2 are complete and early adopters have successfully run a predefined selection of their typical work.

1.11 Summary of Attachments

- Attachment 1 – RFP Schedule
- Attachment 2 – Bid Summary Form
- Attachment 3 – InfiniBand Configuration Reference
- Attachment 4 – Ethernet Configuration Reference
- Attachment 5 – Cabinet & Floor Layout Example
- Attachment 6 – Hardware Installation Requirements
- Attachment 7 – Software Installation and Start-Up Services
- Attachment 8 – SMU Installation Verification & Benchmarking

- Attachment 9 – Various SMU Software
- Attachment 10 – Questions / Responses
- Attachment 11 – SMU Draft Master Services Agreement

Section 2 – GENERAL INFORMATION / INSTRUCTIONS

2.1 Background

Southern Methodist University (SMU or University) is soliciting proposals from qualified suppliers to build a high-performance compute cluster. This new cluster will bea follow-on to the existing high-performance computing cluster.

This new cluster will be a general use cluster supporting computational research across all University disciplines including Data Science, Big Data Analytics, and AI/ML classes of applications.

A list of application software used on the existing cluster is provided in Attachment 9.

2.2 RFP Overview – Base Proposal and Optional Proposals

Based on research, SMU has determined a set of minimum hardware specifications described in Section 3 and software specifications described in Section 4 of this RFP that SMU believes will meet the needs of the campus research community.

SMU is requesting suppliers review these specifications carefully and request clarifications through the established question/response process. Each Company should provide up to four proposed configurations that will help SMU maximize the power and flexibility of the system while still being cost competitive. Companies may offer just one configuration but the one proposal must match the specification in all aspects for the components (aka sections) being bid.

Companies should offer any new technologies that SMU may not be aware of in optional proposals. If technologies are not yet released, provide a description and the estimated release date of these technologies and how they could be incorporated in the future. Companies may suggest alternatives to any and all of the hardware components, configuration, or other items provided in Section 3 as an optional proposal.

2.3 SMU Next Generation HPC Cluster Design Targets

2.1.1 At least 11,000 cores compute capacity.
2.1.2 8 high memory compute nodes (>= 2 TB each).
2.1.3 170 standard compute nodes (>=256 GB memory)
2.1.4 InfiniBand interconnects to support all compute nodes, storage devices and service nodes with a capacity to grow up to 360 ports. Spine switches are excluded from this maximum. [Other high-speed interconnect solutions will be considered if it matches the capabilities of InfiniBand.]
2.1.5 Additional consideration for storage cabinet InfiniBand switches:
- Implement sufficient redundancy to overcome single point of failure with regards to storage-nodes/storage-appliances connecting to TOR switches or spine switches.

2.1.6 Additional consideration for service node cabinet switches
- Distribute service nodes between two cabinets for service redundancy, and each cabinet having its own TOR switches.

2.1.7 At least 10Gb Ethernet connection to all nodes for NFS storage and in-band nodemanagement.
2.1.8 1Gb Ethernet connection to all nodes and devices for out-of-band node

management.

2.1.9 Competing configurations with AMD and Intel processors are requested each with at least 32 cores per processor.

2.1.10 All configurations need to support PCIe Gen. 4.

2.1.11 RFP asks each Company for base proposal configured with industry standard 1u and 2u servers and InfiniBand HDR interconnects. A second (optional) proposal may be submitted with any innovative options the Company chooses to offer as long as it meets software compatibility and performance of base configuration.

2.1.12 Start-up services to be included to shorten deployment time after hardware arrival.

2.1.13 Cluster Management Software included to enable rapid deployment/provisioning/monitoring of new systems and software to all nodes. Cluster management software must facilitate configuration management of custom OS images.

2.1.14 System Management Software included to facilitate firmware management and hardware configuration (e.g., BIOS) management.

2.4 Bid Options and Format

Each bid will include the following sections as discrete bids with associated pricing:

- Servers described in section 3.2
- InfiniBand Network Fabric in section 3.3
- High Performance Cluster Storage 3.4
- Ethernet Network Fabric in section 3.5
- Cluster Management Software in section 4.1
- Various Software in section 4.2
- Software installation and startup services in section 5.1

Each bidder must propose a solution that meets all of the requirements for each section noted above. The only exception to this is if a bidder is only submitting or not submitting a bid for High Performance storage. Section 3.4 of the RFP is the only section that can be bid independently. If you are not submitting a bid for a Section of the RFP please indicate with an entry of ‘no bid’ where relevant.

Hardware, Software and Maintenance must be subtotaled separately for each sub-section noted above.

Bidder must clearly identify the Company responsible for different levels of software support submitted in the bid.

In addition to the Company's normal proposal format, each Company must provide a bid summary in the form provided in attachment 2.

2.5 Shipping

All shipping expenses must be clearly stated as included or must be not-to-exceed cost clearly indicated. Delivery address for all equipment is to the SMU University Data Center at 5555 N. Central Expressway, Dallas, TX, 75205.

Section 3 – HARDWARE SPECIFICATIONS

3.1 General Cluster Specifications

3.1.1 This cluster will be installed in the University Data Center at SMU. The space is not constrained by power, cooling or floor space.

3.1.2 All power and data cables between Cabinets must be run above the cabinets. Cable trays provided by SMU.

3.1.3 All servers will be interconnected via (a) InfiniBand HDR speed/latency (or better) and (b) 10Gb (or better) Ethernet connection to all nodes internal to the cluster and (c) 1Gb Ethernet connection for cluster management over IPMI/BMC and (d) cabinet PDU data link (1 per cabinet).

3.1.4 All campus facing nodes will have an additional 10Gb or greater Ethernet connection for external communications via Campus Network. The Data Transfer nodes will also include a 100Gb interface for connecting to external data sources.

3.1.5 All ethernet switches must include 100G or higher uplink capabilities to accommodate both 2:1 oversubscription ratio and allow outside cluster campus backbone uplinks at 100Gbs or higher.

3.1.6 SLURM is used as the scheduler.

3.1.7 SMU will provide conditioned power to the cluster via UPS with standby Diesel generator at 400/230v (note: power is not 480/208v).

3.1.8 The InfiniBand switch must provide minimum bandwidth equal to HDR and maximum latency no higher than HDR with 2:1 oversubscription. The configuration is described with respect to an InfiniBand switch as the reference solution.

3.1.9 The system is expected to contain two (2) different classes of compute nodes; 1) standard nodes with 256 GB+, 2) large memory nodes with 2 TB+.

3.1.10 ECC memory is required which must be certified by the motherboard manufacturer, and must run at the fastest allowed memory speed for the processor.

3.1.11 Power supplies must maintain a true power factor of 0.9 or greater at 50% rate load and higher. Higher efficiency power supplies are preferable.

3.1.12 Provide the manufacturer and model number of the motherboard and chassis for all nodes.

3.1.13 It is important that Company meets the requirements of the section on Cluster Management Software which discusses the proposed hardware capabilities and its manageability using cluster management software as the reference capability.

3.1.14 It is important that Company meets the requirements of the section on System Management Software which discusses the firmware and hardware configuration management capabilities.

3.1.15 Company must also identify and support version of OS, firmware, and driver that is compatible for InfiniBand hardware (switches and HBA's).

3.1.16 The Company will include a fully functional BIOS able to take a node from power on or reset state to the start of the Linux kernel as loaded from a network connection or local disk (if a local hard disk is installed). The provenance of the BIOS (e.g., vendor,etc.) must be specified.

3.1.17 Company will provide comprehensive BIOS documentation for the delivered nodes. This documentation will include description of all parameters, default factory settings, how to modify them, and how to use the tools to manage the BIOS.

3.1.18 All provided node BIOS will be capable of booting the node from a remote OS image across the management Ethernet network using PXE, BOOTP, DHCP, or other public protocols.

3.1.19 A written plan will be submitted with proposal outlining Company's plans and process to provide BIOS updates to address problems or deficiencies in the areas of functionality, performance, and security.

3.2 Detailed Minimum Specifications – Servers

Following are minimum specifications required for the primary/base quote. Additional/optional quote must meet or exceed these specifications.

SMU will be providing APC AR3350 cabinets for all equipment. Electrical is provided via PDI overhead rails using Tap Off boxes. All network cabling to appropriate top of rack switch must be included in the server pricing. Top of rack uplinks will be provided in the Networking proposal sections 3.5 & 3.6. Cabling for Campus Network connections to be handled by SMU.

Delivery and installation:

The following to be included in the scope of this section:

A. Provide and install all cables connecting servers to top of rack switches for InfiniBand and Ethernet for both out of band and in band communications.
B. Cable PDU to top of rack Ethernet switch for communications.
C. Ethernet Cabling to campus network for external communications will be handled by SMU.
D. Cabinet grounding will be handled by SMU.

Other requirements common to all servers:

E. Dedicated out of band IPMI/BMC hardware interface is expected with support for latest IPMI. Define exceptions and specify how cluster management softwarewould be interfaced and if any additional licensing is required for advanced remote console.
F. IPMI/BMC set to default Boot with DHCP prior to turning over the hardware.
G. Must provide IPMI/BMC serial over LAN support.
H. Must include support for booting over NVMe, M.2 device or other solid-state media.

I. Company must specify hard drive manufacturer for all the hard drives included on the servers to assist with easy deployment of the systems using Cluster Management Software.
J. Company must specify type of RAID Controller and manufacturer for all servers to assist with easy deployment of the systems using cluster management solution such as Bright Cluster Management Software.
K. Company must provide a list in CSV format of MAC addresses of all network interfaces on all servers included in the proposal for easy deployment of the systems.
L. Must support x86 64-bit based Rocky Linux, CentOS Stream, RHEL versions 8.0+, and Ubuntu 20.04.03 LTS release or higher.
M. Must support and include any license and software for advanced DRAC/iLO with remote console capabilities and software to manage BIOS and firmware updates.
N. Must provide full support for remote node management using fully compliant IPMI 2.0 implementation, including virtual console.
O. Must be able to utilize both in-band and out-of-band power control of servers.

3.2.1 Support Nodes (quantity = 22 total)

Common to all Servers in section 3.2.1:

- RAID Controller including battery backup. If battery backup is extra cost note how much.
- Memory: 512GB DDR4 Dual Rank, x8 Data Width. The memory shall be DDR4 or faster SDRAM with registered DIMMs, ECC andChipkill capability functional in maximum performance mode. Fort cluster manager head nodes, LR-DIMMs will be considered, if cost-effective and necessary to accommodate increased memory capacity. All memory channels shall be populated equally. Dual rank memory is preferred as long as it can operate at full clock rate. Company shall propose the most reliable, highest performance memory configuration.
- Networking:
  One 1Gb port to Ethernet switch for hardware remote management connected to BMC.
  One 10Gb port to the Ethernet switch for NFS and general cluster management.
  One HDR IB card connected to the HDR InfiniBand ToR leaf switch.
- Power Supplies: (2) hot swappable redundant. Provide specifications on power supplies and note reason for selection and efficiency rating for the configuration.
- 1u form factor
- 5-year, Next Business Day hardware maintenance and support.

A. Admin Nodes (quantity = 3)

- CPU: (2) 32-core at least 2.4GHz processors
- Additionally, one 10G and one 100Gb Fiber Ethernet port to the campus backbone
- Hard Drives: (5) at least 800 GB, SSD, hot swappable, enterprise class disk drives, 5 drives configured as a RAID-5 or RAID-6 for system software and data storage.

B. HPC Portal (quantity = 2)

- CPU: (2) 32-core at least 2.4GHz processors
- Additionally, one 10G and one 100Gb Fiber Ethernet port to the campus backbone.
- Hard Drives: (5) at least 800 GB, SSD, hot swappable, enterprise class disk drives, 5 drives configured as a RAID-5 or RAID-6 for system software and data storage.

C. SLURM Nodes (quantity = 2)
- CPU: (2) 32-core at least 2.4GHz processors
- One 10Gb Fiber Ethernet port to the campus backbone
- Hard Drives: (5) at least 800 GB, SSD, hot swappable, enterprise class disk drives, 5 drives configured as a RAID-5 or RAID-6 for system software and data storage.

D. Monitoring Nodes (quantity = 4)
- CPU: (2) 32-core at least 2.4GHz processors
- One 10Gb Fiber Ethernet port to the campus backbone
- Hard Drives: (3) 3 TB, SAS, hot swappable, enterprise class disk drives, 7200 RPM, 3 drives configured as a RAID-5 for system software and data storage.

E. Proxy and/or Gateway Nodes (quantity = 2)
- CPU: (2) 32-core at least 2.4GHz processors
- One 10Gb Fiber Ethernet port to the campus backbone
- Hard Drives: (2) 3TB, SAS, hot swappable, enterprise class disk drives, 7200 RPM, 2 drives configured as a RAID-1 for system software and data storage.

F. Login Nodes (quantity = 5)
- CPU: (2) 32-core at least 2.4GHz processors
- One 10Gb Fiber Ethernet port to the campus backbone
- Hard Drives: (2) at least 250GB, SSD, hot swappable, enterprise class disk drives, 2 drivesconfigured as a RAID-1 for OS.

G. Data Mover Nodes (quantity = 2)
- CPU: (2) 32-core at least 2.4GHz processors
- One 10Gb and two 100Gb Fiber Ethernet port with optic to the campus backbone
- Hard Drives: (2) at least 800GB, SSD, hot swappable, enterprise class disk drives, 2 drivesconfigured as a RAID-1 for OS.

H. Cluster Management Nodes (quantity = 2)
- CPU: (2) 32-core at least 2.4GHz processors
- Memory: 512GB DDR4 RDIMMs, Dual Rank, x8 Data Width. Memory shall be DDR4 or faster SDRAM with registered DIMMs, ECC and Chipkill capability functional in maximum performance mode. LR-DIMMs will be considered, if cost-effective and necessary to accommodate increased memory capacity. All memory channels shall be populated equally. Dual rank memory is preferred as long as it can operate at full clock rate. Company shall propose the most reliable, highest performance memory configuration.
- One 10Gb Fiber Ethernet port to the campus backbone
- Hard Drives: (5) 800 GB, SSD, hot swappable, enterprise class disk drives, 5drives configured as a RAID-5 or RAID-6 for system software and data storage.

3.2.2 Base Compute Nodes (quantity = 170)

- CPU: x86 (2) processors (AMD or Intel) minimum 32 Cores >= 2.4GHz.
- Memory: 256 GB DDR4, 3200+ MT/s, Dual Rank
- Hard Drives: One (1) 120GB M.2 SSD as boot device
- Networking:
  One 1Gb port to Ethernet switch for hardware remote management.
  One 10Gb port to the Ethernet switch NFS/systems management.
  One HDR IB card connected to the HDR InfiniBand leaf switch.
- Power Supplies: Two (2) hot-swappable, redundant. Provide specifications on

power supplies andnote reason for selection and efficiency rating for the configuration.
- 1u form factor Alternative solution could be provided as an alternative with documentation of benefits.
- 5-year, Next Business Day hardware maintenance and support.

3.2.3 High Memory Compute Nodes (quantity = 8)

- CPU: x86 (2) processors (AMD or Intel) minimum 32 Cores >= 2.4GHz
- Memory: 2 TB DDR4, 3200+ MT/s, Dual Rank
- Hard Drives: six (6) 800GB Solid State Hot Swap Drives
- Networking:
  One 1Gb port to Ethernet switch for hardware remote management.
  One 10Gb port to the Ethernet switch NFS/systems management.
  One HDR IB card connected to the HDR InfiniBand leaf switch.
- Power Supplies: Two (2) hot-swappable, redundant. Provide specifications on power supplies andnote reason for selection and efficiency rating for the configuration.
- 1u form factor Alternative solution could be provided as an alternative with documentation of benefits.
- 5-year, Next Business Day hardware maintenance and support.

3.2.4 Cabinets & Power Distribution

SMU will be providing Power infrastructure to the racks, tap off boxes and PDU's, to feed the racks. All of the rest of the power to devices is to be included in the response. See section 3.8 for specifications and quantities.

3.3 Detailed Minimum Specifications – High Performance Cluster Interconnect Fabric

Based on InfiniBand HDR Network Switch Fabric as the reference capability. Equivalent solutions are acceptable with clear pro/con comparison to the reference capability.

3.3.1 360-port (or larger) HDR leaf InfiniBand switch capacity including the required number of spine switches to support a flat tree network topology with 2:1 oversubscription.

Following configuration is based on InfiniBand interconnect for all server nodes with a number of assumptions that may change. Company is welcome to change cabinet layout if there is significant savings or other advantages.
Notes:
1. Assumes single row with cabinet housing Spine Switches in center.
2. Assumes all compute cabinets are fully populated but storage/support cabinets would not be.

3.3.2 Supply and installation of all uplink cables from TOR switches to spine switches to be included.
3.3.3 Installation of all switches with latest firmware code is to be included.
3.3.4 Selection of InfiniBand switches managed or unmanaged must support Adaptive routing and NVIDIA Scalable Hierarchical Aggregation and Reduction Protocol (SHARP) technology. If High Performance Interconnect fabric is other than InfiniBand, list out any comparable offloading specs available for alternate fabric proposed.
3.3.5 Necessary cabling for both in-cabinet to TOR switches and Leaf-to-Spine switches must be included and must be of sufficient length to accommodate the design layout

3.3.6 ConnectX-6 Adapter Cards to be included with Server Configuration cost anditemized for easier comparison to other solutions.

3.3.7 Technical Support and Warranty for 5 years must be included with next business day SLA for non-critical devices and 24x7 support for critical devices. Compute nodes leaf switches are considered non-critical, while managed or unmanaged spine and storage leaf switches are considered critical.

3.4 Detailed Minimum Specifications – High Performance Cluster Storage

SMU's ManeFrame II supercomputing cluster currently features two disk-based, high-performance filesystems that serve local and remote users:

- *Scratch (Lustre FS):* The /scratch filesystem is a 2.3-PB high-speed filesystem whose intended use is as a location for temporary files used by users' jobs for performing computations that require high rates of storage I/O. It is a Lustre FS 2.12.5 filesystem with 48 OSTs hosted on 12 NetApp E5600 arrays. Eight of these are fully loaded with sixty (60) 4-TB 7200-RPM 6.0-Gbps SAS hard drives each, and four more are likewise fully loaded with additional 60-drive expansion arrays for a total of 120 4-TB 7200-RPM SAS drives each. Metadata is served by 2 MDTs hosted on a NetApp EF560 array. This array is loaded with 18 800-GB SAS 6.0-Gbps solid state drives. As it is intended that users will clean up these files once their computations have completed, the contents of the /scratch filesystem are not backed up in any way, rather users are strongly encouraged to keep copies of any critical data files elsewhere in locations where they will be backed up and/or archived.

- *Work (Lustre FS):* The /work filesystem is a 768-TB high-speed filesystem whose intended use is for short-term storage of files that need to be maintained on the system for a period beyond that generally expected for temporary files in /scratch but are not in continued active use by users' running jobs. It is a Lustre FS 2.12.5 filesystem with 14 OSTs hosted on 2 NetApp E5700 arrays. Each array holds seven (7) 8-TB 7200-RPM 12-Gbps SAS hard drives. Metadata is served by MDTs hosted on a NetApp EF570 array. This array is loaded with 24 800-GB SAS 12.0-Gbps solid state drives. The /work filesystem is not recommended for use by users' running jobs. Though the /work filesystem is intended to allow users to keep certain files on the system beyond what is typical for files in /scratch, it is still considered to be short-term storage and is not backed up, so users are strongly encouraged to keep copies of any critical data files elsewhere in location where they will be backed up and/or archived.

3.4.1 File system design specification

SMU seeks to purchase a high-performance filesystem storage to support high performance storage needs of our HPC compute cluster. SMU currently has Lustre file system in its environment and is open to other enterprise grade file systems that can meet the specification described in this section. The file system should have a total usable capacity of at least **3 PB** with performance specifications and use case capabilities meeting those described below. The file system should be composed of flash and/or faster spinning drive storage and provide for incremental growth.

The new high-performance storage will be used to configure with two different namespaces of the proposed file system primarily to support two requirements:

1) A short-term **scratch space** ($SCRATCH) for all jobs running on the cluster. $SCRATCH will be implemented with no quotas, but automatically purge data based on purge policy decided and set by SMU.

2) A **work space** ($WORK) intended for mid-term to longer term retention of datasets or files that does not fit the scope of temporary $SCRATCH space used in jobs. This namespace will be setup with quotas to restrict usage by either user-id(UID) or group-id(GID).

Both $SCRATCH and $WORK file system will be treated as volatile storage and not backed up; hence the Company's objective is to propose and implement a more robust, scalable, and redundant design of end-to-end storage components eliminating single point of failures. High-performance storage will be split between $SCRATCH and $WORK into a usable capacity of 2 PB and 1 PB respectively. Both $SCRATCH and $WORK will be mounted on roughly between 250 - 300 clients. A typical workflow would be to use $SCRATCH during a job and upon completion of the job copy important file(s) to be preserved to a medium-term storage $WORK for longer retention.

Preferred characteristics of the new file system to support the HPC system should include:

- Provide a solution that a Company can provide end to end support of the proposed file system, and/or describe the levels of the support the Company provides and levels of the support provided by a third party, if applicable.
- Provide a solution that is highly available with end-to-end hardware redundancies and failover protections.
- Provide a solution capable of supporting at least 40 GB/s sustained aggregate read and 40 GB/s sustained aggregate write of streaming data to $SCRATCH file system.
- Provide a solution capable of supporting at least 30 GB/s sustained aggregate read and 30 GB/s sustained aggregate write of streaming data to $WORK file system.
- Provide a solution with metadata storage sized to support at least or over a billion inodes for both $SCRATCH and $WORK filesystems respectively.
- Provide a solution capable of supporting over 150,000 sustained file creates and over 150,000 sustained file-unlink operations per second for both $SCRATCH and $WORK individually.
- If a combination of flash and non-flash storage drives are to be used in the proposed solution, ensure at least 30 GB/s sustained aggregate write of streaming data performance is available from non-flash storage for $SCRATCH.
- Provide administrative client nodes that can support and perform administrative tasks for the proposed filesystems. Include any tools, API and/or licenses required to perform administrative tasks.
- $WORK storage will be mounted across two different clusters. Provide any necessary and sufficient administrative client nodes/device that enables mounting of the filesystem across two different clusters and maintains required bandwidth for file system access across clusters.
- If the proposed filesystem deploys a mixed set of drives such as NVME and SAS/SSD, describe in detail and how if a filesystem can auto-tier the data between fast vs slower storage namespaces. Emphasize if the tiering of data is transparent to end user or not.
- Include tools, APIs and/or licenses required at storage layer, and at filesystem layer for management, monitoring, alerting and reporting of storage utilization, usage, failures and operational metrics. A description of a list of things that these tools should be capable of are listed below.
    - Real time monitoring of metadata information about users, groups, jobs, and usage based on logical location of data, its age and size.
    - Automatic mechanism for enforcing storage administrator defined policies based on available metadata information. For example, deleting of files periodically based on available metadata such as file creation time and its age.
    - Support storage subsystem HA, fault monitoring and alerting mechanism via syslog, SNMP, and SMTP.
    - Display storage subsystem component level metrics, such as bandwidth, IO sizes and latencies etc.

    - Monitored metrics should be recorded and be available in the same interface for displaying trends of historical metrics for up to a year.
    - File system specific metrics should also be recorded and be available in the same interface for displaying trends of historical metrics for up to a year.
- Provide options for any I/O characterization tool known to work well to capture application I/O behavior for the proposed file system.
- Describe how proposed system could be expanded in terms of both performance and capacity without replacing hardware and leveraging initial deployment. Describe in detail by how much and how to obtain the next level of incremental performance boost with additional hardware purchase.
- Propose a solution that enables filesystem upgrades with minimal impact and/or downtime from production use of the system. Emphasize capabilities of the solution with respect to upgrades and its impact.
- Provide a fixed cost option to purchase an expansion within the 24 months of issued purchase order to (a) increase the performance by 10 GB/s and/or (b) to increase just capacity by 1PB useable space.

3.5 Detailed Minimum Specifications – Ethernet Cluster Fabric

3.5.1 Ethernet Top-of-Rack (TOR) switch with an oversubscription ratio of 2:1 or higher to match in rack server counts and its TOR connection ports at 10 Gb/s minimum for each port or higher.
3.5.2 Maintain TOR switch to spine switch oversubscription ratio at 2:1 or higher with port density and performance to meet the base line speeds of 10Gb/s or higher.
3.5.3 Ethernet TOR switch to support port count for each server and its IPMI/BMC interface at 1Gb/s.
3.5.4 Ethernet TOR switch port availability for in-cabinet PDU connection at 1Gb/s.
3.5.5 Ensure spine/core switches have enough ports available to connect NFS storage appliance at 100 Gb/s or higher, in addition to support MLAG and/or link aggregation between storage appliance and spine/core switches.
3.5.6 360 aggregate Ethernet port capacity in switches with dual power supplies.
3.5.7 Include and supply all uplink cables from TOR switches to spine switches.
3.5.8 Installation of switches with latest firmware code to be included.

3.6 General UDC Floor Layout and Cooling Design

3.6.1 All equipment must be air cooled with front to back airflow to work within hot-aisle containment system. Hot-aisle containment system is provided by SMU.
3.6.2 Systems with alternative cooling methods can be offered in the secondary proposal. Piping for chilled water based in-cabinet cooling is available. All associated expenses to deliver chilled water to the cabinet must be included in the proposal.
3.6.3 Weight and heat per cabinet must be specified for all proposals. Floor loading and heat dissipation for specifications in the primary proposal are not expected to be a concern.
3.6.4 The space allocated for the cluster cabinets allows for 16 cabinets per row currently we have 16 racks available for this project. If the proposed solution is greater than that arrangements can be made but SMU would need to be informed so that accommodations can be made.
3.6.5 Hot-aisle is 4 feet across from back edge of each row of cabinets.

3.7 Cabinet Specifications

3.7.1 Cable management, ease of cluster maintenance and cooling are important. Extra deep cabinets are required. The APC NetShelter 42U 750mm wide x 1200mm deep cabinets with sides & front/back doors are used as the reference capability. These cabinets will be supplied by SMU. Where practical, leave the bottom 2U unused.

3.7.2 If the total wattage of a rack is greater than 25kW adjustments are to be made to cabinet layout. A load of <16kW per rack is desired for the regular compute nodes. If the solution is based on a high-density footprint that would need to be called out.

3.7.3 SMU will provide blanking panels.

3.7.4 All power and data cables between Cabinets must be run above the cabinets. Cable trays provided by SMU.

3.7.5 Cabinet grounding will be handled by SMU.

3.8 Electrical Requirements

3.8.1 Data Center power is 400/230v. All equipment must work with this electrical power specification.

3.8.2 Power is delivered via dual 400Amp Overhead Busway for each row to support A-side and B-side power where needed. Not all equipment will have redundant power supplies.

3.8.3 Current standard rack power is provided by redundant 400V 30A 3 Phase circuits. If additional power is required, please provide specifics.

3.8.4 Installation of the equipment within the racks, the installer is required to make sure power is evenly distributed across all three phases of the PDU's

3.8.5 SMU is responsible for ensuring the 3-phase power at the Busway level is balanced and will make adjustments as needed.

Section 4 – SOFTWARE SPECIFICATIONS

4.1 Cluster Management Software

SMU currently uses Bright Computing's Bright Cluster Manager Advanced Edition with Premium Support. Other cluster management solutions will be considered. Alternative solutions must be compared to Bright Cluster Manager for feature parity and provide clear advantages for the proposed alternate solution.

Provide a quote for both BCM and/or alternative cluster management software with a minimum of 5 years premium support and, up to 6 years if possible.

Below are key requirements that will help us provision/deploy and manage the HPC cluster and its environment using Bright Cluster Management Software.

A. Company must suggest recommended shared file system type (NAS) and size of the *Image repository* for cluster management software.
B. Solution must support use of open-source configuration management system such as ansible, *puppet* or other similar tools.
C. Solution must support provisioning of listed operating systems in section 3.2.
D. Company must list any support if included for DMTF standards such as Redfish etc.
E. Company must note additional features available at no additional cost, such as Hadoop and/or Kubernetes integration etc.
F. Company must list any exclusions in the proposed solutions in reference to metric collections and monitoring and reporting capabilities of the proposed solution.

4.2 Various SMU Software - Application Software and Compilers

SMU's choice for workload manager is SLURM. Provide a quote to include support for SLURM from vendor(SchedMD) with the proposal based on the configuration(s) submitted. See attachment 9 for a list of other SMU Application software and Compiler requirements, compatibility with these packages is required.

Section 5 – SOFTWARE INSTALLATION & START-UP SERVICES

5.1 Software Installation and Start-Up Services

See attachment 7 for Software Installation and Start-up Services specifications.

Section 6 – INSTALLATION VERIFICATION & BENCHMARKING

6.1 Installation Verification and Benchmarking

See Attachment 8 for Installation Verification, Benchmarking and Acceptance Testing specifics.

Section 7 – PROPOSAL CONTENT

7.1 Proposal Submittal

For consideration, Company must submit a comprehensive response that meets the minimum requirements included in the RFP and the corresponding attachments.

Proposals are required to follow the exact order as provided in the RFP document so that all proposals can be evaluated on an equal and timely basis.

7.2 Proposal Deadline and Timestamp

Initial proposal must be received by 3:00 p.m. CST on or before Friday, February 18, 2022. Any requested subsequent submissions will include a deadline time and date. Timestamp inserted into email headers by the email servers will be used as the official time fordelivery.

7.3 Company Information, Personnel and Services

Bidder should provide a brief (no more than two pages with a minimum font size of 11) profile listing pertinent information that can be used to evaluate the proposal.

Consider this an opportunity to differentiate Company from other bidders and how SMU will recognize added value before and after the sale.

7.3.1 Include the company name, corporate and local addresses (if different), main phone number, web address, and person authorized to commit the company to the terms specified in the proposal. Provide a brief history of the firm and number of years in business.

7.3.2 Provide information on the composition of the firm including those individuals assigned to work with the University. List the names, positions, responsibilities and a brief description of their experience (highlight university experience) for each of your personnel that will be assigned to SMU's account. List the address and contact information of the office that will be serving this account.

7.4 Subcontractor Information (if applicable)

List the names and addresses of any subcontractors that will be utilized on this account. State what services they will provide. If applicable, indicate whether the listed subcontractors are certified as MBEs (Minority Business Enterprise) or WBEs (Women Business Enterprise), SDVOB (Service Disabled Veteran Business), or HUB (Historically Underutilized Business.)

7.5 References

Please provide a minimum of three account references that are similar in size and scope to SMU. The list must include each reference's name, address, contact person, length of relationship, and a description of the services provided.

7.6 Multiple Proposal Option

Provide no more than 4 different proposals for SMU to review.

The Primary Proposal(s) must be based on the specification provided in the RFP for an AMD and Intel based solution. If only submitting a single architecture please indicate why.

Each proposal should be based on performance, cost and a solution Company sees as beneficial for SMU. Include a complete and detailed listing of all components, specifications and software for the configuration. In addition, all components should be identified by make, model and specifications

(Cabinets, motherboards, memory, disk drives, NIC's, disk controllers, managed Ethernet switches, power supply, etc.).

7.7 Optional Proposal

Optionally, up to 3 additional proposal(s) may be presented based on any technology that meets the sameor better performance as the primary configuration and is fully compatible with SMU's Research Software configuration (see Attachment 9). SMU will accept alternative hardware configuration based on the specifications outlined in Section 3, if Company views this as the best option for SMU.If Company chooses to submit a secondary/alternative proposal it must be totally separate from theprimary/base proposal. Include as Supplement 2 of your RFP response.

Section 8 – RFP EVALUATION/SELECTION

8.1 Evaluation Committee

Each proposal will be evaluated by the RFP Evaluation Committee comprised of Research Faculty and Office of Information Technology personnel within the University.

The RFP Evaluation Committee will initially review all proposals for completeness and compliance with the terms and conditions of the RFP. Proposals clearly inconsistent with the RFP requirements will be eliminated from further consideration. Proposals that pass the completeness and compliance review will be evaluated against the Basis of Selection outlined below. The RFP Evaluation Committee is the sole judge of the best offers and reserves the right to accept or reject any or all proposals. The bidder recognizes this by submitting a proposal.

8.2 Basis of Selection

The RFP Evaluation Committee will evaluate proposals and select firms based on a best value analysis involving the following factors.

8.2.1 The bidder's plan to meet the requirements in the Scope of Work including the quality of the proposal, specifically, responsiveness to SMU requirements and adequacy of information provided.

8.2.2 The firm's relevant experience, qualifications and previous success in providing High Performance Compute Cluster configuration and installation as outlined in this RFP.

8.2.3 Total cost of ownership as submitted in accordance with Attachment 2.

8.2.4 The firm's ability to demonstrate quality of work and superior customer service.

8.2.5 Any other factors relevant to the firm's capacity and willingness to satisfy the University's High Performance Compute Cluster needs.

Attachment 1 - Schedule

SOUTHERN METHODIST UNIVERSITY - RFP Schedule

All dates are expected to be met unless otherwise notified in writing. The deadline is 3:00PM Central Time for each date. SMU may adjust the dates at any time for any reason with written notice.

Ref	Date	Description / Actions
1.	1/3/2022	Send out the RFP to selected vendors.
2.	1/14/2022	Deadline for round 1 questions from vendors back to SMU Purchasing.
3.	1/21/2022	Deadline for SMU response to questions back to all vendors.
4.	1/28/2022	Deadline for round 2 questions from vendors back to SMU Purchasing.
5.	2/4/2022	Deadline for SMU response to questions back to all vendors.
6.	2/18/2022	Initial proposals due to SMU Purchasing.
7.	3/7/2022- 3/11/2022	On-site for presentation by vendors (if needed)
8.	Week of 4/4/2022	Vendor(s) selection and PO(s) issued.
9.		Planning meeting held at SMU University Data Center with Installation Supervisor of Hardware Company(s) and Start-up Services Provider for detailed planning session. Hardware Vendors expected to provide delivery schedule for all hardware.
10.		All hardware delivered and ready to begin installation. All proposals must include delivery schedule commitment.
11.		All hardware installed, cabled, powered up, configured and ready for OS/Software Installation. Reference RFP for installation requirements. • Payment milestone Software Installation & Start-up Services ready to begin.
12.		Software Installation and Start-up services complete. Cluster fully configured and ready for SMU benchmarking/acceptance testing to begin. Reference RFP for software installation and startup services deliverables. • Payment milestone
13.		SMU benchmark/validation complete and system accepted by SMU pending any outstanding issues or punch list items! • Payment milestone
14.		Early adopter phase begins with select group of power users running cross-section of typical workload.
15.		Early adopter phase ends. At this point work for early adopters has been validated and runs smoothly on the new cluster. • Payment milestone Begin transition from ManeFrame II [SMU reference point only].
16.		All data/users moved off the old cluster(s) to the new cluster [SMU reference point only].

Attachment 2

Cost Summary - SMU Next Generation HPC Cluster

Section	*Description*	*Hardware Cost (without maintenance)*	*Hardware Maintenance*	*Software Cost*	*Software Maintenance*	*Total Cost*	*Comments*
3.2	Servers (includes servers, power & cabinets)						Without InfiniBand card
3.2b	Servers - InfiniBand Cards or Other Solution						Itemize so other options can be compared
3.4	Storage – High Performance						
3.4	Network - InfiniBand or Other Solution						
3.5	Network - Ethernet						
4.2	Software - Cluster Management Tools	---	---				
5.1	Software Installation and Start-Up Services	---	---	---	---		
Total From All Sections							Sum from competitive components
					Discount If Comprehensive Award		All or nothing discount
					Total If Comprehensive Award		All or nothing discounted total

Attachment 3

SOUTHERN METHODIST UNIVERSITY – RFP

Attachment 3 – InfiniBand Reference

This attachment is blank and will be updated with first round of questions.

Attachment 4

SOUTHERN METHODIST UNIVERSITY – RFP

Attachment 4 – Ethernet Reference

This attachment is blank and will be updated with first round of questions.

Attachment 5

SOUTHERN METHODIST UNIVERSITY – RFP

Attachment 5 – Cabinet and Floor Layout Reference

This attachment is blank and will be updated with first round of questions.

Attachment 6 – Hardware Installation Requirements

Included here is a summary of information provided throughout section 3 of the RFP and to further clarify as needed. If differences exist between Attachment 6 and main RFP, this attachment takes precedence as an easy reference and consolidation of requirements.

Company(s) providing hardware must be sure to include these requirements (and shipping) in the price of each hardware component.

1. Server Provider Responsibilities

A. Reference RFP subsection 3.2.
B. Installation of all servers in appropriate cabinets.
C. Provide and install all cables connecting servers to top of rack switches for InfiniBand.
D. Provide and install all cables connecting servers to top of rack switches for 10Gb Ethernet (front-side production).
E. Provide and install all cables connecting servers to top of rack switches for 1Gb Ethernet (IPMI/BMC interface).
F. Cable PDU to top of rack 1Gb Ethernet switch (1 per cabinet).
G. Ensure firmware is current.
H. Ethernet Cabling to campus network for external communications will be handled by SMU.
I. Cabinet grounding will be handled by SMU.
J. Support planning, problem determination and problem resolution throughout the implementation, testing and acceptance process.

2. High Performance Storage Provider Responsibilities

A. Reference RFP subsection 3.4.
B. Responsible for installing storage and providing all cabling.
C. Installation of cabling from storage associated servers.
D. Ensure firmware is current.
E. Support planning, problem determination and problem resolution throughout the implementation, testing and acceptance process.

3. InfiniBand Switch (or equivalent) Provider Responsibilities

A. Reference RFP subsection 3.5.
B. Responsible for installing switches and providing all cabling.
C. Installation of cabling from leaf to spine switches.
D. Ensure firmware is current.
E. Support planning, problem determination and problem resolution throughout the implementation, testing and acceptance process.

4. Ethernet Switch Provider Responsibilities

A. Reference RFP subsection 3.6.
B. Responsible for installing switches and providing all cabling.
C. Installation of cabling from leaf to spine switches.
D. Ensure firmware is current.
E. Cabling for Campus Network connections will be handled by SMU.
F. Support planning, problem determination and problem resolution throughout the implementation, testing and acceptance process.

Attachment 7

Software Installation and Start-up Services

Introduction

This document outlines the Software Installation and Start-up Services (Services) for the new HPC Cluster and forms the basis for Company to develop a detailed Statement of Work and Project Plan as part of the Company's proposal.

This document is intended as an outline for scope and expectations to aid development of a detailed proposal. If there are questions or concerns with the level of detail provided, the opportunity to address those concerns is during the two rounds of question/response phase of the RFP.

Rather than just asking questions, suggest providing examples or specific language that could be used to address the questions/concerns that are raised to help foster better understanding of the concern and speed the response.

General

1.1 Payment Milestone

Payment Milestone 2 for Hardware Provider Company(s) and Payment Milestone 1 for Software Installation Services Company. Reference main RFP document.

1.2 Dispute Resolution

Should there be an unresolvable disagreement on the cause or appropriate resolution of any issue with the acceptance testing, SMU can exercise the option to decline the equipment or software and return the component(s) for a full refund less the cost of roundtrip shipping plus $50,000 or 2% of the component value, whichever is less. SMU will give five (5) working days' notice to the primary contact before exercising this option and allow three (3) working days for a written response.

1.3 Roles and Responsibilities

Company awarded the services in this section will lead the work with a Project Manager and the human resources with the requisite skills needed to successfully complete the work described in the proposal.

Hardware installation Company(s) will be on standby to address any hardware failures, cabling issues or firmware configuring problems or controller configuration issues.

SMU will dedicate two (2) FTE to this phase with expected duration of 3 weeks.

It is in everyone's best interest to have a successful software installation and with cluster startup process completed as quickly as possible.

Attachment 7

Proposal Development

2.1 Proposal Input

The Company making a proposal to provide this service should use the information in this section (attachment) to develop a more specific statement of work and project plan for submission as part of the Company's proposal.

2.2 Be Specific & Measurable

- Be as specific as possible on the state the cluster should be in when these services begin.
- Be as specific as possible on what is expected of SMU without getting into minutia (yes we'll provide access to the building, work space and a single point of contact empowered to make decisions).
- Be as specific as possible on what is expected of the hardware providers in support of these services.
- Be as specific as possible on the work product to be delivered and state of the cluster as a result of the services provided.

2.3 Prerequisites

Before the services in this section can begin the hardware will have been delivered, installed and configured to receive the software.

Schedule for this phase is dependent on completion of the hardware installation phase.

Dates and Schedule for Engagement

The exact date for when this engagement will begin is dependent on RFP award(s) for hardware, delivery of hardware and installation of all hardware. The high level schedule identified in RFP attachment 1 is subject to change with notice as the process evolves. The Services Team for this engagement must be able to mobilize with three (3) weeks' notice.

Summary of Services

Thinking of implementation of the new cluster as a multiple step process, the scope of this service is everything required in Step 3.3 plus resolution of associated issues through successful completion of steps 3.5 & 3.7.

3.1 All hardware delivered, physically racked, cabled and powered with latest firmware installed. Hardware vendors required to support problem identification and resolution in steps 3.3 and 3.5.
3.2 Step 3.1 complete.
3.3 Scope of this Services Engagement is to take the new cluster from step 3.2 to step 3.4 and support problem identification and resolution in step 3.5 and step 3.7.
3.4 Step 3.3 complete and cluster fully operational.
3.5 Run benchmark jobs and acceptance testing.
3.6 Step 3.5 completed successfully and cluster hardware accepted by SMU.
3.7 SMU early adopters execute selected suite of work.
3.8 Step 7 completed successfully and cluster software accepted by SMU.

Attachment 7

Scope of Service

The scope of work in this section begins with handoff from the hardware install team(s) and is considered substantially complete when the cluster is fully operational and ready for SMU to begin running benchmark jobs for acceptance testing. Work continues until all problems identified during benchmark process and early adopter phase for power users is complete.

See below for an outline of configuration items to be implemented and start up work to be completed. This is by no means an exhaustive list, but intended to help clarify expectations as input for Company to develop a detailed Statement of Work and Project Plan as part of the Company's proposal.

4.1 Configure Ethernet Production switches (front side network), with port channels, VLANs, MLAGs or tagging if required.

4.2 Configure Ethernet Out-of-Band Management switches (IPMI/BMC network).

4.3 Configure InfiniBand (or similar) switches, with subnet configuration and subnet managers as required.

4.4 Setup Mellanox SHARP environment for SMU to leverage offloading collective operations.

4.5 Configure networking for each type of hardware, including, servers, all types of network switches, storage hardware, and in rack PDU's, such that they can be accessed and monitored over the network from designated admin servers.

4.6 Isolate data and management traffic with appropriate VLANs and subnets as required by design per SMU team.

4.7 Configure High Performance Storage as a single logical component as described in the high-performance storage specification section (3.4) to meet the required performance levels.

4.8 Work with SMU team to setup storage administrative nodes to configure a dashboard that can provide the required visibility into storage utilization, usage and monitoring capabilities.

4.9 Work with SMU team to install and configure a production HPC Cluster using the proposed Cluster Manager solution, as a single logical component. See below for an outline of (to be further developed as part of the scope) steps.

- 4.9.1 Configure proposed cluster manger solution in an HA setup. SMU requires HA nodes be installed in two different cabinets to provide true redundancy from any in cabinet network failures between cluster manager HA nodes.
- 4.9.2 Configure DHCP, DNS, NTP, TIFTP and Subnet manager services as appropriate for both Ethernet and InfiniBand (or similar) devices connecting the compute nodes in the network.
- 4.9.3 Configure all traffic originating from compute nodes and leaving the cluster to go through a designated administrative node configured either as a NAT/Proxy. SMU team prefers NAT/Proxy be separated from cluster provisioning head nodes.
- 4.9.4 Configure Admin, Login and Compute nodes with appropriate network topology, wherever these nodes are setup with both public and private facing interfaces.
- 4.9.5 Configure disk partitioning for local storage if provisioned on compute nodes.
- 4.9.6 Configure BMC (IPMI/iLO) for remote control and provisioning.
- 4.9.7 Configure networking switches and PDU’s for remote management and monitoring.
- 4.9.8 Work with SMU team to configure and integrate user authentication into storage appliances and cluster devices using SMU provided authentication services such as LDAP and/or Active Directory where appropriate.
- 4.9.9 Configure SLURM workload manager database to provide failover capability between active/passive SLURM nodes. SMU prefers Active and Passive SLURM nodes to be setup in two different cabinets to protect it from in cabinet network failures. SMU team prefers separating workload manager nodes from cluster provisioning nodes.
- 4.9.10 Install and configure OFED (or similar) stack required for high-speed networks, on all nodes in the cluster
- 4.9.11 Configure monitoring and alerting of at least 5 services to demonstrate the process.

4.9.12 Configure BMC (IPMI/iLO) SOL (serial over LAN) for direct console access to servers using proposed cluster manager solution.

4.9.13 Demonstrate creating software images and provisioning different Linux flavors such as RHEL and Ubuntu.

4.10 Provide any or all scripts or programs used to setup all of the above services or components, in addition to documents covering every step and configuration.

4.11 Demonstrate that each installed port on each switch and each server carries traffic successfully.

4.12 Change all passwords from default to those provided by SMU (to be changed by SMU again later).

Out of Scope

Company must clearly specify any potential 'gray areas' that are considered out of scope. This should be used to add clarity to the proposal and not to avoid reasonable accountability.

Planning & Project Management

Initial Planning step is identified in Attachment 1 of the RFP Schedule. Company handling the Services Engagement is expected to lead the planning meeting and produce the implementation plan with focus on this engagement scope and include a framework for the hardware installation plan.

In the planning phase, Services team will work with SMU team and other Company(s) providing hardware and software components to build the cluster implementation plan.

Project Planning b*egins after the PO has been awarded and before the hardware arrives on site.* Services team will drive the project planning towards a fully configured and tested cluster ready to roll out for production use.

Deliverable from the initial planning session is an overall implementation plan with clear tasks, schedules and responsibilities identified.

Below is an initial outline of activities the project planning should include to help clarify the expectations. This is by no means an exhaustive list, but intended as input for the Statement of Work for the services proposal.

5.1 Work with SMU and Hardware team(s) to define meeting schedule to address issues, adjust plan, update status, communicate with teams involved with implementation and provide SMU management reporting.

5.2 Identify deliverables for each team involved in cluster installation and start-up.

5.3 Identify rack-layouts of different type of cabinets for the final configuration.

5.4 Ensure naming/labeling plan is in place for hardware/software components and cables to ensure productive communication and aid problem determination.

5.5 Based on the final configuration chosen, identify a software/firmware compatibility list, including the version of the OS & drivers, that will be supported during the initial implementation.

5.6 Determine execution order of different installation steps and the teams involved.

5.7 Determine the requirements of the number of IP addresses required, including a range of IP addresses for public facing NIC’s, private interfaces, InfiniBand (or similar) interfaces, and management interfaces.

5.8 Plan for isolation of different types of data and management traffic with different types or networking devices.

5.9 Plan for user authentication management, in reference to integrations required with storage hardware and entire cluster hardware. Goal here is identifying pre-requisites to test before the actual implementation of user authentication required for an operational cluster with all its devices and storage solution proposed.

5.10 Plan to build redundancy into cluster services and the underlying hardware and its components where available. For example, build services that can be failed over to other nodes as needed for maintenance, hence planning ahead in using VIP (virtual IP) as necessary for cluster services.

5.11 Plan for intermediate component validation steps, as different services and components are setup to ensure and eliminate difficulties in identifying problems as we get ready to test the entire cluster to exercise each of its functionalities and capabilities.

Knowledge Transfer

Company providing Software Installation and Start-up Services for the new cluster and its components is required to provide the necessary knowledge transfer to the designated SMU team members for:

- Cluster Manager, system setup and operation.
- InfiniBand setup and operation
- Ethernet setup and operation
- High Performance Storage operation

Documentation

Useful and reasonable configuration details for each component.
Schematic for all network components.
Final cabinet layout.
Final High Performance
storage layout.

Measures of Success

General measures of success for the Services Engagement:

6.1 All hardware is successfully installed in two (2) weeks. SMU recognizes this is out of Services Company's control except for help with high level planning.

6.2 Software Installation & Start-up Services is successfully completed in three (3) weeks. True message of success is in items 6.3 and 6.4 below.

6.3 Benchmark Jobs successfully completed in three (3) weeks.

6.4 SMU selected early adopters able to run typical work without errors.

SMU Responsibilities

Provide Single Point of Contact empowered to make decisions on behalf of SMU.
Provide two (2) Sysadmin FTE dedicated to the Cluster Implementation as project resources.
Provide OS image for each category of server.
Provide network connectivity to campus and internet.
Provide workspace for project team members as needed.

Attachment 7

Hardware Company(s) Responsibilities

Have knowledgeable representative present for implementation planning empowered to communicate component installation plans and status.

Be on-call to quickly assist with problem determination of potential hardware issues and to quickly resolve any issues determined to be a hardware problem.

Ensure IPMI/BMC boards are all updated to most current version and configured to work with Bright Cluster Management.

Assumptions

Note any assumptions being made that are relevant and necessary to clarify scope of services being delivered.

Personnel and Their Skills and Qualifications

Specify the number of staff the proposal will include and their skills and qualifications for delivering the services included in the proposal.

Change Management Process & Work Schedule

The new cluster is a self-contained greenfield implementation, meaning the cluster is a new & complete system to be implemented without concern for impact production jobs running on the same system or impact on user work schedules or limited by change management windows within the scope of this new cluster.

Work plans for the new cluster implementation can be executed 24/7.

The Change Management exception is connectivity to the campus network or the internet but those changes will be quick and straight forward.

Pricing and Expenses

Quote as one lump sum amount including all miscellaneous expenses such as food, travel and lodging.

Installation Verification, Benchmark and Acceptance

This document describes the methods to be used by SMU to verify installation, validate operational status of all components and measure performance against internal expectations and industry benchmark standards.

This document is intended as an outline of expectations, methods and intent. If there are concerns, the opportunity to address those concerns is during the two rounds of question/response phase of the RFP.

Recommend providing examples or specific language to address any questions/concerns that are raised to help foster better understanding of the concern and speed the response.

Introduction

1.1 Prerequisites

The Validation and Benchmark phase will begin after all the hardware has been delivered and installed and all the Software Installation & Start-up tasks have been completed.

Speed and effectiveness of this phase is highly dependent on the accuracy and completeness of the previous installation/start-up phases.

1.2 Roles and Responsibilities

SMU will develop and execute the Benchmark jobs. Both internal and industry standard benchmarks will be included. SMU will dedicate two (2) FTE to this phase with expected duration of 3 weeks.

Hardware venders are required to have staff on standby to quickly resolve any suspected hardware issues related to installation or controller configuration.

Software Installation and Start-up services are required to be available to quickly resolve any software or configuration related issues.

1.3 Payment Milestone

Payment Milestone 3 for Hardware Provider Company(s) and Payment Milestone 2 for Software Installation Services Company. Reference main RFP document.

1.4 Dispute Resolution

Should there be an unresolvable disagreement on the cause or appropriate resolution of any issue with the acceptance testing, SMU can exercise the option to decline the equipment or software and return the component(s) for a full refund less the cost of roundtrip shipping plus $50,000 or 2% of the component value, whichever is less. SMU will give five (5) working days' notice to the primary contact before exercising this option and allow three (3) working days for a written response.

SMU Internal Benchmark Jobs

2.1 Expectations

Purpose of SMU internal benchmark jobs is to ensure compatibility with existing cluster, ensure performance exceeds that of existing cluster and verify configuration setup meets operational services delivery equal to existing (old) cluster or better.

2.2 Measures of Success

The measures of success describe how the cluster as a whole and/or each component get a passing grade. This is not designed or expected to be an onerous process but it is expected to be thorough enough to ensure the cluster is ready to rapidly accept and transition the existing ManeFrame II data and user community.

General measures of success for running the SMU software noted in Table 2.3.1 is:

2.2.1 Jobs run to completion
2.2.2 Run time is as good or better than ManeFrame II (existing cluster).
2.2.3 Results are expected and reasonable when compared to ManeFrame II results.

In more specific terms, for jobs related to SMU's research, the benchmark work will include:

2.2.4 A suite of jobs frequently run on ManeFrame II that span various calculation and computational resource requirements (i.e. serial, parallel, memory-intensive, I/O-intensive, accelerated, etc.). This suite of jobs must run to completion on the new cluster and report reasonable results when compared to identical ManeFrame II jobs.
2.2.5 Of course, the expectation is that similar jobs of particular types should generally perform better than comparable ManeFrame II work given the same resources. Jobsthen tailored to the new cluster's architecture should significantly improve performance.
2.2.6 Job throughput should be improved on the new cluster, which is a function of not only performance, but also of general system stability demonstrated in consistent and predictable (wall clock) run times.

Passing grade for cluster performance of SMU benchmark jobs will be a comparison of wall clock time for identical calculations. Further optimization of the job and software is expected to provide additional performance improvement. Throughput can be measured as wall time for a group of calculations. Group calculations will also span various calculation and computational resource requirements and the number of jobs.

2.3 SMU Verification and Benchmark Calculations

The following SMU applications will be used with problems of various size and complexity to verify and benchmark the new cluster. The problems will be specific to the type of node that is currently capable of running the calculation on the existing (old) cluster, which can then be compared with appropriate node configurations of the next generation (new) cluster.

Table 2.3.1

Application Type	Queue Type	Application	Calculation Type
Single-threaded	Serial	R	Statistical analysis
Single-threaded	Serial	ROOT	Statistical analysis
Single-threaded	Serial	AutoDock	Drug docking
Single-threaded	Serial	MATLAB	Linear algebra
Single-threaded	Serial	SAS	Statistical analysis
Single-threaded	Serial	STATA	Statistical analysis
Single-threaded	Serial	Python	Statistical analysis
Shared-memory	Parallel	Gaussian	Quantum chemistry
Shared-memory	Parallel	CHARMM	Classical molecular dynamics
Shared-memory	Parallel	NAMD	Classical molecular dynamics
Shared-memory	Parallel	MATLAB	Linear algebra
Shared-memory	Parallel	SAS	Statistical analysis
Shared-memory	Parallel	STATA	Statistical analysis
Distributed-memory	Parallel	Gaussian	Quantum chemistry
Distributed-memory	Parallel	CHARMM	Classical molecular dynamics
Distributed-memory	Parallel	NAMD	Classical molecular dynamics
Distributed-memory	Parallel	Qbox	Quantum molecular dynamics
Distributed-memory	Parallel	NASA Parallel Benchmark Suite	Linear algebra
Shared-memory	High and dense memory	Gaussian	Quantum chemistry
Shared-memory	High and dense memory	CFOUR	Quantum chemistry
Shared-memory	High and dense memory	GAMESS	Quantum chemistry

Industry Standard Benchmark Jobs

3.1 Expectations

Purpose of running the suite of Industry Standard Benchmark jobs noted in Table 3.3.1 below is to exercise every major component as well as exercise the entire cluster with performance that meets the expectations of the investment.

Secondary goal of the Industry Standard Benchmark jobs is to burn-in the components of the cluster to a level that demonstrates all components (including cabling) are fully functional and operationally reliable.

3.2 Measures of Success

General measures of success for running the Benchmark jobs are:

3.2.1 Jobs run to completion.
3.2.2 Run time is reasonably close to the theoretical and/or advertised design of the component(s) or the clusteras a whole.
3.2.3 Results are expected and reasonable per industry standard output.

3.3 Industry Standard Benchmark Jobs

Below is the list of system benchmarks that SMU will run against CPU, IB network and storage hardware to exercise components involved as part of the burn-in test process. In addition, SMU will record raw end-to-end performance to serve as a reference for later use. SMU will run these benchmarks using the chosen Linux flavor of the operating system discussed in section 3.2.

The suite of benchmark jobs will be updated once the final hardware configuration is known.

Table 3.3.1

Item	***Benchmark***	***Objective***
A.	HPL	Run HPL LINPACK to obtain a reference peak performance benchmark of individual nodes and the cluster as a whole.
B.	High Performance Conjugate Gradients	Similar to HPL run HPCG to exercise the subsystem to different data patterns and observe peak performance.
D.	STREAM	Run this standard memory benchmark to exercise the memory subsystem and note sustainable memory bandwidth of the system.
E.	OSU Micro-benchmark	Run OSU micro-benchmark to exercise InfiniBand fabric and observe Bandwidth and Latency in comparison to its theoretical peak.
F.	MDtest & IOR	Benchmark High Performance file system as a whole to observe sustained performance for acceptance testing.
H.	IOZONE	Benchmark to find bottlenecks in the system.

Various Software List

Vender	Product (sorted by)	Quantity / Seats	Linux Version	License Type	Primary Users	Website
3DS Dassault Systemes	ABAQUS		Yes	Closed	Engineering	http://www.3ds.com/products-services/simulia/products/abaqus/
ANSYS	ANSYS		Yes	Closed	Engineering	http://ansys.com/Products/Academic/High-Performance-Computing
ATLAS	ATLAS	Unlimited	Yes	Open	Campus	http://math-atlas.sourceforge.net
AutoDock	AutoDock Vina	Unlimited	Yes	Open	Biology, Chemistry	http://autodock.scripps.edu
Boost	Boost	Unlimited	Yes	Open	Campus	http://www.boost.org
Cadence	CADENCE		Yes	Closed	Engineering	http://www.cadence.com/products/pages/default.aspx
CFOUR	CFOUR	Unlimited	Yes	Open	Chemistry	http://www.cfour.de
CHARMM	CHARMM	Unlimited	Yes	Closed	Chemistry	https://www.charmm.org/charmm/
Kitware	CMAKE	Unlimited	Yes	Open	Campus	https://cmake.org
COMSOL	COMSOL Multiphysics		Yes	Closed	Engineering	www.comsol.com/comsol-multiphysics
IBM	CPLEX		Yes	Closed	Math	www-03.ibm.com/software/products/en/ibmilogcpleoptistud/
DMTCP	DMTCP	Unlimited	Yes	Open	Campus	dmtcp.sourceforge.net/index.html
DYNARE	DYNARE	Unlimited	Yes	Open	Economics	www.dynare.org
FFTW	FFTW	Unlimited	Yes	Open	Campus	www.fftw.org
ANSYS	FLUENT		Yes	Closed	Engineering	www.ansys.com/Products/Fluids/ANSYS-Fluent
GAMESS	GAMESS	Unlimited	Yes	Open	Chemistry	www.msg.ameslab.gov/gamess/index.html
GAMS	GAMS	1	Yes	Closed	Math	www.gams.com/index.htm
APTECH	GAUSS		Yes	Closed	Math, Statistics	www.aptech.com/products/gauss-mathematical-and-statistical-system/
Gaussian	Gaussian	Unlimited	Yes	Closed	Chemistry	www.gaussian.com/index.htm
GNU	GCC	Unlimited	Yes	Open	Campus	gcc.gnu.org
Geant4	Geant4	Unlimited	Yes	Open	Physics	www.geant4.org/geant4/
git	Git	Unlimited	Yes	Open	Campus	git-scm.com
GNU	GSL	Unlimited	Yes	Open	Campus	www.gnu.org/software/gsl/
The HDF Group	HDF	Unlimited	Yes	Open	Campus	www.hdfgroup.org
Altair	HYPERWORKS		Yes	Closed	Engineering	www.altairhyperworks.com/hw14/
LLNL	HYPRE	Unlimited	Yes	Open	Campus	computation.llnl.gov/projects/hypre-scalable-linear-solvers-multigrid-methods/software
Julia	Julia	Unlimited	Yes	Open	Campus	julialang.org
Sandia National Laboratories	LAMMPS	Unlimited	Yes	Open	Biology, Engineering	lammps.sandia.gov
Hepforge	LHAPDF	Unlimited	Yes	Open	Campus	lhapdf.hepforge.org
Gaussian	LINDA	Unlimited	Yes	Closed	Chemistry	www.gaussian.com/index.htm
LSTC	LS-DYNA		Yes	Closed	Mechanical Engineering	www.lstc.com/products/ls-dyna
Macaulay2	Macaulay2	Unlimited	Yes	Open	Math	www.math.uiuc.edu/Macaulay2/

Vender	Product (sorted by)	Quantity / Seats	Linux Version	License Type	Primary Users	Website
Wolfram	Mathematica	Unlimited	Yes	Closed	Campus	www.wolfram.com/mathematica/
MAT File I/O Library	MatIO	Unlimited	Yes	Open	Campus	sourceforge.net/projects/matio/
Mathworks	MATLAB	Unlimited	Yes	Closed	Campus	www.mathworks.com/products/matlab/

Various Software List

MOLCAS	MOLCAS	Unlimited	Yes	Closed	Chemistry	www.molcas.org
Molpro	Molpro		Yes	Closed	Chemistry	www.molpro.net/?portal=visitor&choice=Introduction
MPICH	MPICH	Unlimited	Yes	Open	Campus	www.mpich.org
MVAPICH	MVAPICH	Unlimited	Yes	Open	Campus	mvapich.cse.ohio-state.edu
NAMD	NAMD	Unlimited	Yes	Open	Biology, Chemistry	www.ks.uiuc.edu/Research/namd/
The NEST Initiative	NEST	Unlimited	Yes	Open	Math	www.nest-simulator.org
UCAR	NetCDF	Unlimited	Yes	Open	Campus	www.unidata.ucar.edu/software/netcdf/
Open MPI	OpenMPI	Unlimited	Yes	Open	Campus	www.open-mpi.org
Max-Planck Institute	ORCA	Unlimited	Yes	Closed	Chemistry	orcaforum.cec.mpg.de
Lorentz Solution	Peakview		Yes	Closed	Engineering	www.lorentzsolution.com
ANL	PETSc	Unlimited	Yes	Open	Campus	www.mcs.anl.gov/petsc/
Psi4	PSI	Unlimited	Yes	Open	Chemistry	www.psicode.org/index.php
Lund University	PYTHIA	Unlimited	Yes	Open	Physics	home.thep.lu.se/~torbjorn/Pythia.html
Python	Python	Unlimited	Yes	Open	Campus	www.python.org
Q-Chem	Q-CHEM	Unlimited	Yes	Closed	Chemistry	www.q-chem.com
R Project	R	Unlimited	Yes	Open	Statistics, Marketing	www.r-project.org
CERN	ROOT	Unlimited	Yes	Open	Physics	root.cern.ch
SAS	SAS		Yes	Closed	Marketing, Finance	www.sas.com/en_us/software/university-edition.html
3DS Dassault Systemes	SOLIDWORKS		No	Closed	Engineering	www.solidworks.com/sw/education/sw-research.htm
STATA	STATA		Yes	Closed	Marketing, Finance	www.stata.com
Synopsys	Synopsys		Yes	Closed	Engineering	www.synopsys.com/Tools/Pages/default.aspx
TUG	TeX Live	Unlimited	Yes	Open	Campus	www.tug.org/texlive/
Cadence	TSMC		Yes	Closed	Engineering	www.cadence.com/Alliances/ip_program/Pages/tsmc_lib.aspx
UCAR	UDUNITS	Unlimited	Yes	Open	Campus	www.unidata.ucar.edu/software/udunits/
Apache	Xerces	Unlimited	Yes	Open	Campus	xerces.apache.org

Attachment 10

SOUTHERN METHODIST UNIVERSITY - RFP Q & A

Attachment 10 is blank and included here as a placeholder pending first round of questions.

Attachment 11

SMU Draft Master Services Agreement

MASTER SERVICES AGREEMENT

BETWEEN

SOUTHERN METHODIST UNIVERSITY

AND

[CONTRACTOR]

This Master Services Agreement, effective as of the date signed by the last party below (this "**Agreement**"), is made between **Southern Methodist University**, a Texas nonprofit corporation ("**SMU**"), and [Contractor], a [enter state] limited liability company ("**Contractor**"). "Contractor" shall include any affiliate of Contractor. SMU and Contractor agree to the following terms and conditions:

ARTICLE 1

SERIVCES, HARDWARE AND SOFTWARE

This Agreement shall apply each time SMU engages Contractor to provide services. All services (the "**Professional Services**") and hardware and software (the "**Products**") provided will be described in one or more mutually agreed "**Statement of Work**" ("**SOW**"). "Professional Services" does not include third party branded services ("**Third Party Services**") that may be purchased from a third party by SMU or sold by Contractor in connection with the Professional Services provided (e.g. extended warranty on third party branded peripherals offered by the manufacturer). All orders for Professional Services and Products must specify Contractor's quotation (if any), and reference the Professional Service(s) and Product(s) requested and invoice address. SMU may place orders in writing, by telephone or by facsimile transmission. Telephone orders must be confirmed in writing or by facsimile. All orders are subject to acceptance by Contractor.

This Agreement does not bind Contractor to provide the Professional Services or Products solely to SMU. Contractor may provide comparable professional services and products to others without prejudice to this Agreement.

ARTICLE 2

TERM AND TERMINATION

2.1 This Agreement is hereby executed and effective on the date on which it is signed and initialed by the last of those required to sign and initial this Agreement and shall end at the conclusion of business on [enter date]. This Agreement may be executed in multiple counterparts, including facsimile counterparts, each of which shall be deemed an original, and all of which together shall constitute one and the same instrument. SMU reserves the right to extend this Agreement by written direction of the President, a Vice President or other authorized signatory identified in Exhibit C, for two additional one-year terms on the terms, including, without limitation, pricing terms, specified in this Agreement.

2.2 Either party may terminate this Agreement by providing at least sixty (60) days prior written notice to the other. Termination of the Agreement will not terminate any outstanding SOWs, and the terms of this Agreement will survive such termination to the extent that such terms are incorporated into any outstanding SOWs. Either party may terminate an individual SOW if the other party commits a material breach of the terms of the SOW or this Agreement and the breach is not cured with thirty (30) days of receipt of written noticed from the injured party. Termination of one or more SOWs will not terminate this Agreement. Upon termination, all rights and obligations of the parties under this Agreement will automatically terminate except for rights of action accruing prior to termination, payment obligations and any obligations that expressly or by implication are intended to survive termination.

2.3 (a) In the event of the breach of any of the terms of this Agreement by either party, the non-breaching party may terminate this Agreement if (1) the non-breaching party provides written notice to the breaching party that a breach has occurred, the nature of the breach, and the date this Agreement shall terminate, which shall be no less than thirty (30) days from the date of the written notice, and (2) the breaching party fails to cure the breach within the thirty (30) day period.

(b) If a party files a petition or be adjudged bankrupt or insolvent under any applicable federal or state bankruptcy or insolvency law, or admits that it cannot meet its financial obligations as they become due; or if a receiver or trustee is appointed for all or substantially all of the assets of the party; or if a party makes a transfer in fraud of creditors or makes an assignment for the benefit of creditors that shall be considered a breach of this Agreement and the non-breaching party may terminate this Agreement immediately.

ARTICLE 3

AGREEMENT SUM AND PAYMENTS

3.1 Pursuant to the terms and conditions of this Agreement, each SOW shall specify the method of compensation for the Professional Services and Products to be provided by Contractor and shall be as authorized by SMU's Representative, as identified in Exhibit C, and agreed to by Contractor. Contractor shall be compensated for providing the Professional Services and Product based on Total Lump Sum for each SOW.

3.2 The prices charged for Professional Services and Products purchased under this Agreement will be Contractor' then current charges for such Professional Services and Products or as quoted by Contractor in the SOW. Any required deposits are non-refundable.

Prices are exclusive of all country, provincial, state and local sales, use, value added, excise, privilege, franchise and similar taxes. Taxes imposed on Contractor (other than taxes related to Contractor' income) in connection with the Professional Services and Products purchased under this Agreement will be paid by SMU and will appear as separate items on Contractor' invoices. SMU will provide documentation of tax exempt status.

3.3 SMU shall be afforded access to Contractor's records, books, correspondence, instructions, receipts, subcontracts, purchase orders, vouchers, memoranda and other data relating to this Agreement for a period of three (3) years after final payment, or for such longer period as may be required by law. Information provided for such access shall be limited to the Professional Services performed in connection with this Agreement.

3.4 SMU's Representative, as identified in Exhibit C, without invalidating this Agreement, may order changes in the Professional Services and Products defined in a SOW, consisting of additions, deletions or modifications, the Agreement term being adjusted accordingly; provided that the Agreement term shall not exceed the term set forth in Article 2. Such changes in the Professional Services and Products shall only be authorized by subsequent written SOWs signed by SMU's Representative, as identified in Exhibit C, and Contractor. Contractor releases and waives all claims for extras, changes or increases therein unless such extras, changes and increases are specifically authorized by subsequent written SOWs.

3.5 Contractor shall invoice SMU upon completion of providing the Professional Services and Products described in each SOW per the payment terms detailed in the SOW. Each invoice shall reference the SMU Purchase Order Number assigned to the SOW and shall be delivered to the address set forth in Exhibit C.

3.6 Each invoice shall be due and payable by SMU thirty (30) days after satisfactory completion of Professional Services and acceptance and approval of Professional Services and Products and of such invoice by SMU. For invoices not paid within thirty (30) days of the invoice date, Contractor reserves the right to charge SMU a late penalty charge of one and a half percent (1.5%) per month applied against undisputed overdue amounts, or the maximum rate permitted by law, whichever is less. In addition, Contractor may, without waiving any other rights or remedies to which it may be entitled, decide not to accept additional orders from SMU and/or seek collection of all amounts due, including reasonable legal fees and costs of collection.

3.7 Payments by SMU for the Professional Services and Products shall be made only to Contractor and shall be sent to Contractor at the address designated in Exhibit C.

ARTICLE 4

AGREEMENT DOCUMENTS

The following documents form a part of this Agreement and are attached hereto and incorporated herein by reference:

Exhibit	**Title**
A	RFP [enter number/name], Contractor's response to RFP, and all best and final offers and clarification statements submitted in writing by Contractor
B	Insurance Requirements
C	Primary Location of Business to Receive Invoices and Payments; Designated Persons to Receive Notices and Authorized to Sign
D	Project Schedule

In the event of a conflict between (i) the provisions of this Agreement, and the attached Exhibits A, B and C and any SOW, as completed by SMU and (ii) the provisions of any proposal or bid from Contractor, then the provisions of this Agreement and the attached Exhibits A, B and C and the SOW, as completed by SMU will control.

ARTICLE 5

RESPONSIBILITIES OF CONTRACTOR

5.1 By execution of this Agreement, Contractor represents that Contractor will visit the premises where

Contractor is to perform the Professional Services under this Agreement and become familiar with the local conditions under which the Professional Services and Products are to be provided. Contractor understands and agrees that work shall be scheduled in such a manner as to not conflict with academic or administrative activities. Contractor understands and agrees that no work shall be performed pursuant to this Agreement without a SOW executed by both SMU and Contractor.

5.2 Contractor is responsible for ensuring that all persons performing any part of the Professional Services or providing Products comply with the obligations of the Contractor set forth in each SOW.

5.3 Contractor shall not subcontract any portion of the Professional Services to be performed under this Agreement without advance written approval by SMU. Contractor shall notify SMU's Representative, as identified in Exhibit C, of the names of any subcontractors, persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each of the principal portions of the Professional Services. Contractor shall not contract with any subcontractor, person or entity to which SMU has made reasonable objection. By appropriate written agreement, Contractor shall (a) require each subcontractor, person or entity, to the extent of the Professional Services to be performed, to be bound to Contractor by terms of this Agreement, and to assume toward Contractor all obligations and responsibilities which Contractor, by this Agreement, assumes toward SMU; (b) allow to each subcontractor, person or entity the benefit of all rights, remedies and redress afforded to Contractor by this Agreement; and (c) require each subcontractor to enter into similar agreements with sub-subcontractors. Contractor shall maintain all subcontractor agreements, purchase orders, and certificates of insurance at its offices and upon SMU's request shall provide SMU with copies of same.

5.4 Contractor shall give notices required by and comply with all applicable laws, ordinances, rules, regulations and lawful orders of public authorities relating to the Professional Services, including, without limitation, those bearing on safety of persons and property and their protection from damage, injury or loss. Contractor shall obtain and pay for all required permits, licenses and inspections and shall pay all governmental fees required in connection with the Professional Services. Contractor shall be responsible for all fines, penalties and other costs resulting from Contractor's failure to meet its obligations under this Agreement.

5.5 Contractor shall supervise and direct the performance of the Professional Services, using Contractor's best skill and attention. Contractor shall be solely responsible for and have control over the means, methods, techniques, sequences and procedures involved in performance of the Professional Services, so long as such are consistent with all specifications of this Agreement, and for coordination of all portions of performance of the Professional Services under this Agreement, unless otherwise specifically agreed by the parties elsewhere in this Agreement.

5.6 Unless otherwise provided in this Agreement, Contractor shall provide and pay for labor, materials, subcontractors, equipment, tools, machinery, transportation, and other facilities and services necessary for the proper performance of the Professional Services hereunder, whether temporary or permanent.

5.7 (a) Contractor shall enforce strict discipline and good order among Contractor's employees and others performing any part of the Professional Services under this Agreement. Contractor shall not permit unfit persons or persons unskilled in the tasks assigned to them to perform any part of the Professional Services hereunder. Contractor shall also ensure that employment screenings are conducted on all persons who are expected to perform Professional Services, consistent with the duties and responsibilities associated with such individuals' positions, locations of work and other factors. Contractor shall not permit any person to perform Professional Services hereunder if Contractor deems such individual to be an unreasonable risk on the basis of the results of such screenings. SMU reserves the

right to refuse to grant such permission if, in its sole judgment, business necessity requires it to do so. SMU reserves the right to remove immediately from SMU's property (or to require Contractor to remove immediately) any person performing any part of the Services, should such person pose, in the reasonable judgment of SMU, an immediate threat of harm or nuisance to persons or property.

(b) To the extent required by law, all persons performing any part of the Professional Services shall be United States citizens or nationals, lawful permanent residents, or aliens properly authorized to work in the United States.

(c) At SMU's request, Contractor shall provide appropriate documentation demonstrating compliance with the requirements of this Section 5.7.

5.8 Contractor warrants to SMU that the Professional Services performed hereunder shall be performed in a good and workmanlike manner and that they will conform to the requirements of this Agreement. If Contractor provides professional or other expertise for performance of the Professional Services, Contractor warrants that the Professional Services will be performed using reasonable care and skill and according to its current description (including any completion criteria) contained in this Agreement or a SOW. SMU relies upon Contractor's expertise to perform the Professional Services in a manner fit to accomplish those particular purposes stated herein and all other foreseeable purposes. If required by SMU, Contractor will furnish to SMU satisfactory evidence of the kind and quality of materials and equipment it will use to perform the Professional Services or provide the Products hereunder. Contractor shall provide to SMU any documentation from manufacturer(s), including, but not limited to, warranties, service manuals and operating instructions.

5.9 Unless otherwise provided in this Agreement, Contractor shall pay sales, consumer, use and other similar taxes which are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect during the term of this Agreement, to the extent that the taxes are required to be paid.

5.10 Contractor shall confine the Professional Services to areas permitted by law, ordinances, permits and this Agreement, and shall not unreasonably encumber the area with materials or equipment. In addition, Contractor shall restrict all persons performing any part of the Professional Services to such areas. Contractor must obtain authorization for parking of vehicles or equipment on SMU property from SMU's Representative, as identified in Exhibit C. Vehicles and equipment will also conform to all parking regulations of SMU as directed by SMU's Police Department.

5.11 Contractor shall be permitted to use existing entrances and stairs and such other areas only with SMU's prior approval and subject to SMU's security arrangements. Contractor shall at no time have possession of keys, cards or codes allowing access to SMU properties.

5.12 Contractor shall permit SMU access to observe and evaluate Contractor's performance of the Professional Services at any time desired by SMU to the extent that such observation and evaluation does not unreasonably interfere with the performance of the Professional Services.

5.13 INDEMNIFICATION

(a) TO THE FULLEST EXTENT PERMITTED BY LAW, AND EXCEPT TO THE EXTENT CAUSED BY THE NEGLIGENCE OR FAULT OF THE INDEMNIFIED PARTY, CONTRACTOR SHALL INDEMNIFY, DEFEND (WITH COUNSEL REASONABLY ACCEPTABLE TO SMU) AND HOLD HARMLESS SMU, ITS TRUSTEES, OFFICERS, EMPLOYEES, VOLUNTEERS AND/OR AGENTS AND/OR THE SUCCESSORS AND/OR ASSIGNS OF ANY OF THEM (EACH, AN "INDEMNIFIED PARTY") FROM AND

AGAINST ANY AND ALL LOSS, COST, EXPENSE, DAMAGE, INJURY, LIABILITY, CLAIM, DEMAND OR CAUSE OF ACTION, INCLUDING, BUT NOT LIMITED TO, ATTORNEYS' FEES AND COSTS AND EXPENSES OF ANY DISPUTE RESOLUTION PROCEEDING (EACH A "CLAIM" AND COLLECTIVELY, "CLAIMS"), DIRECTLY OR INDIRECTLY ARISING OUT OF, RESULTING FROM, OR RELATING TO CONTRACTOR'S PERFORMANCE OF THE PROFESSIONAL SERVICES HEREUNDER OR OTHER ACTIVITIES OF THE CONTRACTOR, INCLUDING, BUT NOT LIMITED TO:

(i) CONTRACTOR'S BREACH OF THIS AGREEMENT;

(ii) ANY CLAIM ATTRIBUTABLE TO BODILY INJURY OR DEATH OF ANY PERSON, OR TO INJURY TO OR DESTRUCTION OF PROPERTY, INCLUDING, BUT NOT LIMITED TO, LOSS OF USE OF THE PROPERTY;

(iii) ANY LIEN CLAIM OR NOTICE OF LIEN CLAIM ASSERTED BY ANY SUBCONTRACTOR, SUB-SUBCONTRACTOR, SUPPLIER OR EQUIPMENT PROVIDER OF ANY TIER WHO PROVIDES LABOR, MATERIALS OR EQUIPMENT TO THE PROJECT TO CARRY OUT ANY OF THE PROFESSIONAL SERVICES PROVIDED IN THIS AGREEMENT, TO THE EXTENT CONTRACTOR HAS BEEN PAID FOR THE PROFESSIONAL SERVICES; OR

(iv) THE ACT OR OMISSION OF CONTRACTOR, A SUBCONTRACTOR, SUB-SUBCONTRACTOR, SUPPLIER, OR ANY OTHER PERSON OR ENTITY DIRECTLY OR INDIRECTLY EMPLOYED BY SUCH PARTIES OR FOR WHOSE ACTS OR OMISSIONS THEY MAY BE LIABLE.

In the event that an Indemnified Party is found by final award to be negligent or at fault at whole or in part, the indemnity and hold harmless obligation of Contractor with regard to attorneys' fees and costs and expenses of any dispute resolution proceeding shall be reduced by the percentage of fault or negligence of the Indemnified Party. These obligations shall not be construed to negate, abridge or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 5.13.

(b) <u>INDEMNITY – EMPLOYEE INJURY CLAIMS; INTELLECTUAL PROPERTY INFRINGEMENT CLAIMS</u>. IN ADDITION TO THE INDEMNIFICATION PROVIDED IN SECTION 5.13(a) AND TO THE FULLEST EXTENT PERMITTED BY LAW, CONTRACTOR SHALL INDEMNIFY, DEFEND (WITH COUNSEL REASONABLY ACCEPTABLE TO SMU), AND HOLD HARMLESS EACH INDEMNIFIED PARTY FROM AND AGAINST ANY CLAIM (i) DIRECTLY OR INDIRECTLY ARISING OUT OF, RESULTING FROM, OR RELATING TO BODILY INJURY OR DEATH OF ANY EMPLOYEE OF CONTRACTOR, ANY SUBCONTRACTOR OR ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY EITHER, BROUGHT BY SUCH INJURED EMPLOYEE OR THE EMPLOYEE'S WORKERS' COMPENSATION INSURANCE CARRIER; AND/OR (ii) ANY CLAIM THAT ANY MATERIALS CONTRACTOR PRODUCES FOR OR USES AT SMU INFRINGE ON THE COPYRIGHT, TRADEMARK, SERVICE MARK, OR TRADE NAME OR OTHER INTELLECTUAL PROPERTY RIGHT OF A THIRD PARTY, OR PLAGIARIZE THE WORK OF A THIRD PARTY, <u>IT BEING THE EXPRESSED INTENT OF SMU AND CONTRACTOR THAT THE CONTRACTOR IS TO INDEMNIFY, DEFEND AND HOLD HARMLESS EACH INDEMNIFIED PARTY EVEN TO THE EXTENT SUCH CLAIM IS ALLEGED TO BE CAUSED, IN WHOLE OR IN PART, BY THE SOLE OR CONCURRENT NEGLIGENCE OF AN INDEMNIFIED PARTY.</u>

(c) The indemnification of this Section 5.13 shall not be limited by a limitation on amount

or type of damages, compensation or benefits payable by or for Contractor under workers' compensation acts, disability benefit acts or other employee benefit acts. The obligations of Contractor under this Section 5.13 shall survive the expiration of this Agreement.

(d) SMU accepts responsibility for, and agrees to indemnify and hold Contractor harmless from, any and all liability, damages, claims or proceedings arising out of (a) the failure of SMU to obtain the appropriate license, intellectual property rights, or any other permissions required to support any SOW or Contractor' performance of the Professional Services, including, but not limited to, the right to make any copies or reproductions of any SMU provided software, files and information, or (b) any inaccurate representations regarding the existence of an export license or the eligibility for export of software or other materials without a license.

5.14 (a) The consumption of alcoholic beverages and the illegal use of controlled substances shall not be permitted on SMU's property nor shall Contractor employees or any other person performing any part of the Professional Services be under the influence of such substances while on SMU's property. Contractor will comply with SMU's Non-Smoking Policy, a copy of which can be obtained from SMU's Representative, as identified in Exhibit C. Smoking will not be permitted at any location where either SMU or Contractor has posted a "No Smoking" sign, it being understood that Contractor has the obligation to post appropriate "No Smoking" signs as necessary for safety reasons within the spaces for which Contractor is responsible. Further, it is understood that SMU has designated all campus buildings as "No Smoking" areas, which designation must be respected unless a "Smoking Permitted" sign has been posted by SMU.

(b) To the extent permitted by law, the use or possession of dangerous weapons or facsimiles of dangerous weapons on SMU property is prohibited for all persons except for persons duly authorized by the SMU Police Department or by an accredited law enforcement office, to carry a firearm in the performance of their duty.

5.15 Without altering in any way Contractor's liability under this Agreement or applicable law, Contractor agrees to comply with the "Insurance Requirements of the Agreement" attached hereto as Exhibit B and incorporated herein by reference.

5.16 **(**a) Third Party Products, Third Party Services, Software Installation: "Third Party Products" means any hardware or software, other than those that are Contractor branded. Third Party Products and/or Third Party Services may be provided by SMU or procured for SMU by Contractor, as described by the applicable Service. In the event the Third Party Products procured by Contractor are not used for the Professional Services within a reasonable time following purchase of the parts by Contractor, the Third Party Products will be shipped and invoiced to SMU and SMU will pay for these parts within fifteen (15) days after the date of invoice. Contractor is not responsible for any revision or engineering changes in any Third Party Products or Third Party Services. Some manufacturers' warranties or service contract terms and conditions may become void if Contractor or anyone else, other than the manufacturer or its authorized representative, works on the hardware or software. CONTRACTOR DOES NOT TAKE RESPONSIBILITY FOR THIRD PARTY WARRANTIES OR FOR ANY EFFECT THAT THE CONTRACTOR PROFESSIONAL SERVICES MAY HAVE ON THOSE WARRANTIES. Except as agreed to in writing between SMU and Contractor, Third Party Services shall be exclusively subject to terms and conditions between the third party and SMU. For software provided by SMU, SMU authorizes Contractor (or otherwise obtains the rights for Contractor) to copy, install and modify, if necessary (and as required by SOW), all software to be used in the Professional Services

or to be recorded in electronic media for subsequent re-installation of backup. SMU warrants to Contractor that it has obtained any licenses, consents, or approvals required to give Contractor and its subcontractors or employees the right or license to access, copy, distribute, use and/or modify (including creating derivative works) any Third Party Products to be used in the Professional Services, without infringing the ownership or license rights (including patent and copyright) of the providers or owners of such products.

(b) Proprietary Rights: Contractor will retain exclusive ownership in all deliverables created by Contractor hereunder and will own all intellectual property rights, title and interest in any ideas, concepts, know how, documentation or techniques developed by Contractor under this Agreement. Subject to payment in full for the applicable Professional Services, Contractor grants SMU a perpetual, non-exclusive, non-transferable, royalty- free right to use the deliverables solely in the country (ies) in which SMU does business and solely for SMU's internal use.

ARTICLE 6

RESPONSIBILITES OF SMU

It is the SMU's responsibility to backup data on SMU's system. CONTRACTOR WILL NOT BE RESPONSIBLE FOR LOSS OF OR DAMAGE TO DATA OR LOSS OF USE OF ANY COMPUTER OR NETWORK SYSTEMS. SMU acknowledges that Contractor' performance and delivery of the Professional Services are contingent upon: (a) SMU providing access to its personnel, facilities, equipment, hardware, software, network and information and (b) SMU's timely decision-making, notification of relevant issues or information and granting of approvals and/or permission. SMU will promptly obtain and provide to Contractor any required consents necessary for Contractor' performance of the Professional Services described in the applicable SOW.

ARTICLE 7

MISCELLANEOUS PROVISIONS

7.1 With respect to the Professional Services to be provided by Contractor and the administration of this Agreement, SMU and Contractor shall designate a) the primary location of business to receive notices, invoices and payments; b) the parties to receive notices and communications and to act for SMU and Contractor in all respects; and, c) the parties authorized to sign agreements and changes to this Agreement. Such designations are listed in the Primary Location of Business to Receive Notices, Invoices and Payments; Designated Persons to Receive Notices and Authorized to Sign, attached hereto as Exhibit C.

7.2 Any assignment of this Agreement by Contractor, and more specifically assignment to a factoring company, shall be void without the express written consent of the President or a Vice President of SMU. Contractor shall not be relieved of its obligations under this Agreement in the event of an authorized assignment. It is agreed that any sale, merger, corporate reorganization, or significant change of ownership of Contractor or any substantial alteration in the nature or character of its business shall constitute a change in Contractor, and it is agreed that continuation of this Agreement after such a change shall be considered to be an assignment. Contractor has the right to subcontract the Professional Services provided under this Agreement. SMU may not assign this Agreement without the prior written consent of Contractor.

7.3 It is understood and agreed that the relationship of Contractor to SMU shall be that of an independent contractor. Nothing contained herein or inferable herefrom shall be deemed or construed to (1) make Contractor the agent, servant or employee of SMU; or (2) create any

partnership, joint venture or other association between SMU and Contractor. Any directions or instructions by SMU in respect of the Professional Services shall relate to the results SMU desires to obtain from the Professional Services and shall in no way affect Contractor's independent contractor status as described herein.

7.4 Dispute Resolution: The parties will attempt to resolve any claim, or dispute or controversy (whether in contract, tort or otherwise) against Company, its agents, employees, successors, assigns, or affiliates (collectively for purposes of this paragraph, "Company Parties") arising out of or relating to this MSA or any related purchase (a "Dispute") through face to face negotiation with persons fully authorized to resolve the Dispute or through mediation utilizing a mutually agreeable mediator, rather than through litigation. The existence or results of any negotiation or mediation will be treated as confidential. Notwithstanding the foregoing, either party will have the right to obtain from a court of competent jurisdiction a temporary restraining order, preliminary injunction or other equitable relief to preserve the status quo, prevent irreparable harm, avoid the expiration of any applicable limitations period, or preserve a superior position with respect to other creditors, although the merits of the underlying Dispute will be resolved in accordance with this paragraph. In the event the parties are unable to resolve the Dispute within thirty (30) days of notice of the Dispute to the other party, the parties shall be free to pursue all remedies available at law or equity.

7.5 Contractor represents and warrants that no trustee, officer, employee, student or agent of SMU has been or will be employed, retained, or paid a fee, or otherwise has received or will receive any personal compensation or consideration by or from Contractor or any of Contractor's directors, officers, employees, or agents in connection with the obtaining, arranging, or negotiation of this Agreement. Contractor agrees that the consideration to be paid by SMU under this Agreement represents fair and reasonable consideration relative to the value of services to be provided by Contractor to SMU.

7.6 In its performance of this Agreement, Contractor warrants that it will not discriminate against any person on the basis of race, color, religion, national origin, sex, age, disability, genetic information or veteran status. Contractor will also not discriminate against any person on the basis of sexual orientation or gender identity and expression. Contractor affirms that it is an equal opportunity and affirmative action employer and that it will comply with all applicable federal, state and local laws and regulations. The parties hereby incorporate the equal employment opportunity and affirmative action requirements, if applicable, of 41 C.F.R. 60-1.4(a) and 29 C.F.R. Part 471, Appendix A to Subpart A. Contractor and all subcontractors shall abide by the requirements of 41 CFR 60-300.5(a) and 60-741.5(a). These regulations prohibit discrimination against qualified protected veterans and qualified individuals on the basis of disability, and require affirmative action by covered prime contractors and subcontractors to employ and advance in employment qualified protected veterans and qualified individuals with disabilities.

7.7 No waiver of any breach of any provision of this Agreement shall operate as a waiver of any other or subsequent breach thereof or of the provision itself, or of any other provision. No provision of this Agreement shall be deemed to have been waived unless such waiver is in writing and is signed by the party waiving the same.

7.8 Contractor shall not disclose the terms of this Agreement without the express written consent of the President or a Vice President of SMU, unless such disclosure is required by law or court order.

7.9 Nothing contained herein allows Contractor to use the name "SMU" or "Southern Methodist University", or any of its logos or images, except for the purposes set forth in this Agreement, unless prior written permission of SMU's President or Vice President for Development and External Affairs or their respective designees is obtained. Contractor shall take no action that

states or implies or allows another to infer that SMU has approved or endorsed Contractor's products or services. Contractor may discuss SMU's business operations with other business entities, including subcontractors and manufacturers, associated with performing the Professional Services or providing the Products in furtherance of Contractor's business relationship with SMU.

7.10 Contractor shall not report or release information concerning SMU or its trustees, officers, employees, students, volunteers, donors, guests, tenants, agents or alumni or others affiliated with SMU to third parties without SMU's prior written approval. Without limiting the foregoing, any such report or release of information shall, at a minimum, comply with those requirements enumerated in the Gramm-Leach Bliley Act (15 U.S.C. §6801 et seq.; 16 CFR §314 et seq.) and all other applicable laws regarding privacy or protection of personally identifiable information. Without disclosing confidential information,

7.11 This Agreement shall be governed by and construed under the laws of the State of Texas. Each party to this Agreement hereby irrevocably submits to the exclusive jurisdiction of the federal or state courts in Dallas County, Texas, and consents to venue in Dallas County, Texas, for any action arising out of this Agreement. Neither party may institute any action in any form arising out of this Agreement more than two (2) years after the cause of action has arisen, or in the case of nonpayment, more than two (2) years from the date of last payment.

7.12 It is agreed with respect to any legal limitations now or hereafter in effect and affecting the validity or enforceability of the indemnification obligations or any additional insured requirements under this Agreement, such legal limitations are made a part of the contractual obligations and shall operate to amend the obligations to the minimum extent necessary to bring the provision into conformity with the requirements of such limitations, and as so modified, the obligations shall continue in full force and effect. Should any provision of this Agreement be held invalid, unenforceable or contrary to public policy, law, statute or ordinance, then the remainder of the provision, paragraph, section and/or Agreement shall not be affected thereby and shall remain valid and fully enforceable.

7.13 This Agreement, including its exhibits (as set forth specifically in this Agreement), and each SOW constitutes the entire agreement of the parties and supersedes any previous oral or written agreements regarding the subject of this Agreement. Article and section headings are inserted for convenience of reference only and shall in no way alter, modify, or define, or be used in construing the text of such articles or sections. Terms and conditions submitted by Contractor with a proposal, a SOW, an invoice or otherwise are not incorporated in this Agreement. This Agreement shall not be modified or altered, including without limitation, making changes to the scope or cost of the work, except by mutual agreement, confirmed in writing and signed by the parties, with the signature on behalf of SMU being that of the President, a Vice President, or the Chief Information Officer.

7.14 Force Majeure. Neither party shall be liable to the other party for any failure to perform any of its obligations (except payment obligations) under this Agreement during any period in which such performance is delayed by circumstances beyond its reasonable control including, but not limited to, fire, flood, war, terrorist activity, embargo, strike, riot or the intervention of any governmental authority (a "Force Majeure"). In such event, however, the delayed party must promptly provide the other party with written notice of the Force Majeure. The delayed party's time for performance will be excused for the duration of the Force Majeure, but if the Force Majeure events lasts longer than thirty (30) days, the other party may immediately terminate the applicable SOW by giving written notice to the delayed party.

7.15 Limitation of Liability: Neither party will be liable for any incidental, indirect, special or consequential damages arising out of or in connection with the Professional Services or Products provided by Contractors even if a party has been advised of the possibility of such damages. Contractor's total liability arising out of, or in connection with, any event or series of connected

events occurring in connection with the Professional Services or Products that are the subject of the claim, shall not exceed two (2) times the amount of the fees and costs identified in the approved SOWs under this Agreement.

7.16 Counterparts. This Agreement may be executed in counterparts, each of which shall be deemed an original, but all such counterparts shall together constitute one and the same instrument.

7.17 The obligations contained in Sections 3.1, 5.2, 5.4, 5.8, 5.13, 5.15, 5.16, 7.1, 7.2, 7.7, 7.8, 7.9, 7.10, 7.11, 7.12, 7.13, 7.14 and 7.15 of this Agreement shall survive the expiration, completion, abandonment and/or termination of the Agreement and final completion of the Professional Services.

SOUTHERN METHODIST UNIVERSITY

BY:_____
R. Gerald Turner
President

DATE:_____

CONTRACTOR

BY:_____

NAME:

TITLE:_____

DATE:_____

EXHIBIT B
GENERAL TERMS AND CONDITIONS
Office of Risk Management
Insurance Requirements of the Agreement
(Third Party Doing Business with SMU) as of 11/5/2018

A valid Certificate of Insurance must be provided to SMU's Office of Risk Management by any person or entity who is (i) providing goods or services to or for SMU, (ii) using SMU property for events, programs or other purposes or (iii) otherwise doing business with SMU (each a "Contractor"). Insurance must be in place prior to commencement or provision of goods or services or the use of property or other business engagement and must be maintained throughout the term of the contract or other engagement between SMU and the Contractor (the "Contract"), and thereafter, as required below:

1. These requirements apply to Contractor, and to Contractor's contractors, subcontractors, sub-subcontractors, consultants, suppliers and others fulfilling Contractor's obligations under the Contract, whether persons or entities and including international providers ("Subcontractors"). Contractor must require all Subcontractors to comply with the insurance requirements applicable to Contractor.
2. The Contractor must be licensed or otherwise authorized to do business in the State of Texas.
3. Insurance must be written on an ISO form CG 00 01 form or equivalent and must be issued by insurance companies with not less than an AM Best A-III rating.
4. Contractor must waive subrogation against SMU, its trustees, officers, employees, students, volunteers and agents for claims or any other loss arising out of Contractor's negligence or willful misconduct or omission.
5. Contractor shall provide coverage for broad-form indemnification if such indemnification is required by the Contract.
6. Contractor shall maintain all required insurance throughout the duration of the Contract. For any "claims-made" coverage such as insurance for any professional liability or directors and officers coverage, each policy must have a retroactive date prior to the date of project or Contract commencement and must be maintained by the Contractor until completion and for at least three (3) years thereafter either through policies in force or through "tail coverage."
7. Additional insured status shall be written as noted for commercial general liability, automobile liability and excess liability or as noted on the P.2 of this form using ISO additional insured endorsements for ongoing and completed operations. For purposes of this additional insured requirement, "equivalent coverage" means coverage for liability arising out of Contractor's actions and omissions in connection with the Contract, including coverage for the negligence or fault of Contractor and/or SMU or other parties indemnified under the Contract as to bodily injury or death of an employee or agent of the Contractor or of Subcontractors, including products-completed operations.
8. Contractor agrees to allow SMU to review all applicable insurance policies upon request.
9. Contractor is responsible for maintaining its own insurance coverage on its personal property.

The Certificate of Insurance must be completed using the following Description and Certificate Holder language:

1. **DESCRIPTION**: SMU must be named as additional insured unless noted otherwise on the attached form and must include the following language:

   Southern Methodist University, its trustees, officers, employees, students, volunteers and agents are named as additional insured (as the interest of each insured may appear) as to all insurance coverage required.

2. **CERTIFICATE HOLDER**: listed as follows and address to send Certificate of Insurance to:

   Southern Methodist University
   Office of Risk Management
   P.O. Box 750231
   Dallas, Texas 75275-0231 [by courier: 3050 Dyer Ct., Dallas, TX 75205]
   riskmanagement@smu.edu

3. **CONTACT FOR QUESTIONS**: Associate Director, Risk Management
   Your prompt attention in this matter is greatly appreciated. If you have any questions, **please contact (214) 768-2083 or riskmanagement@smu.edu; Fax: (214) 768-4138**

SOUTHERN METHODIST UNIVERSITY
Standard Limits of Liability and Certificate of Insurance Requirements

The following Standard Limits are the minimum requirements for all Contractors. There are specific requirements that supersede the Standard Limits for Contractors providing high-risk services or for other high-risk projects and events. Please consult with the Office of Risk Management.

All Coverages and Limits of Liability listed below are required.

Line of Coverage	Description of Coverage and minimum Limits of Liability		SMU Included as Additional Insured Required
General Liability CG 00 01	**Premises Liability** Personal Injury Products Liability Medical Payments Sexual Molestation/Assault General Aggregate	**$1,000,000 per occurrenc** $1,000,000 $1,000,000 $10,000 $50,000 $2,000,000	Yes
Automobile Liability CG 00 01 CA 00 05, ..12, ..20	**Combined Single Limit**	**$1,000,000 (autos)**	Yes
Workers' Compensation	**Injury/Illness** Employer's Liability	**Statutorily required limits** $1,000,000	N/A
Excess Liability (GL)	Over General Liability, auto, employer's liability (WC)	$5,000,000	Yes
Cyber Liability	**Breach, Privacy, Virus, Security**	**$1,000,000 per occurrence** $2,000,000 aggregate	Yes

EXHIBIT C
PRIMARY LOCATION OF BUSINESS
TO RECEIVE NOTICES, INVOICES AND PAYMENTS

DESIGNATED PERSONS
TO RECEIVE NOTICES AND AUTHORIZED TO SIGN

PRIMARY LOCATION OF BUSINESS TO RECEIVE NOTICES:

All notices and other communications required or permitted herein shall be in writing and shall be given by addressing the same to the intended recipient, at the address set forth below or at such other address as a party hereto may specify by notice in compliance with the requirements of this Section, and by: (a) depositing the same so addressed, postage prepaid, first class, certified or registered, in the United States mail (herein referred to as "**Mailing**"); (b) overnight delivery by a nationally recognized overnight courier service (e.g. UPS, Federal Express); (c) delivering the same personally to such other party(ies); or (d) transmitting by electronic mail or facsimile. Any notice shall be deemed to have been given three (3) U.S. Post Office delivery days following the date of Mailing; one (1) day after timely delivery to an overnight courier; if by personal delivery, upon such delivery; or if by electronic mail or facsimile, the day of transmission if made within customary business hours, or if not transmitted within customary business hours, the following business day. Addresses for notice shall be follows:

For Contractor:

Name
Address
Address
Attn:
Fax:
Email:

For SMU:

Southern Methodist University
George Finney, Information Security Officer
Office of Information Technology
P.O. Box 750262
Dallas, TX 75275-0262
Telephone: (214) 768-3950
Fax: (214) 768-9290

With a copy to:

Vice President for Legal Affairs and Government Relations
Southern Methodist University
P.O. Box 750132
Dallas, TX 75275-0132
Fax: (214) 768-1281

PRIMARY LOCATION OF BUSINESS TO RECEIVE INVOICES AND PAYMENTS:

Invoices shall be sent to SMU by United States mail, postage prepaid, to the following location:

Southern Methodist University
George Finney, Information Security Officer
Office of Information Technology
P.O. Box 750262
Dallas, TX 75275-0262
Telephone: (214) 768-3950
Fax: (214) 768-9290

Payments shall be sent to Contractor by United States mail, postage prepaid, to the following location:

Name
Address
Address

DESIGNATED PERSONS TO RECEIVE NOTICES AND COMMUNICATIONS:

The parties hereby designate and appoint the following persons, whose addresses are designated above, as their representatives respectively, to receive all notices and communications and, to the extent of their obligations, to act for them in all respects.

For Contractor:

SMU's Representatives: Michael Hites, Chief Information Officer

(See "Designated Persons Authorized to Sign", below, for authority to bind the University to expend funds)

Contractor shall not take direction from persons in academic, administrative or operating units of SMU not specifically named herein. It is agreed, if Contractor takes direction from persons not named herein and proceeds to perform additional services, modifies established programming or changes the scope of basic services, SMU shall not reimburse Contractor for any such expenses, shall not extend the schedule of performance of Professional Services, and shall not compensate Contractor for any services or expenses to bring the Professional Services into compliance with the Agreement.

DESIGNATED PERSONS AUTHORIZED TO SIGN:

Unless specifically stated otherwise in the Agreement, the following are the designated persons authorized to sign written authorizations or agreements, including but not limited to Statements of Work or Amended Statements of Work required by the Agreement:

For Contractor:

For SMU:

Statement of Work: Michael Hites, Chief Information Officer

Authorizations, Contracts, Amendments:

Dr. R. Gerald Turner, President, or
Chris Regis, Vice President for Business and Finance; or
another Vice President of Southern Methodist University, or

Michael Hites, Chief Information Officer

Should it become necessary to change the Primary Location of Business to Receive Notices and Payments or the Designated Persons to Receive Notices and Authorized to Sign, any party may do so by giving written notice to the other representatives as provided in the above within seven (7) days of such change.