TERMS OF REFERENCE
FOR THE SUPPLY, DELIVERY, INSTALLATION, TRAINING AND COMMISSIONING OF BIG DATA CLUSTER STORAGE

A. OBJECTIVE

As a part of the Weather Division (WD) strategic approach in data collection, utilization and safekeeping, a high performance, high capacity and reliable storage system is needed. These voluminous data and digital content, which were collected from myriad of data sources, are used in the daily operation of WD especially in weather forecasting. These digital files are all shared across the local area network for file-sharing among WD users and groups. Existing WD storage facilities are continuously filled-up with almost more than 15GB of raw data, preprocessed data and WD products daily. Most of the data files that are kept and archived are those data associated with extreme event occurrences. These data files are mostly used for future reference and research/development purposes.

Since data are continuously getting larger, it is essential to come up with an efficient data safekeeping strategy. Consequently, the preferred solution is a fully symmetric distributed storage architecture that shall deliver superior performance, extensive scale-out capabilities, and a super-large single file system. It will mainly address the storing and handling of extreme volume of wide variety of data types with the speed velocity in data access. Summarily, it is a scale-out storage system designed to scale both capacity and performance. The solution must be capable also to easily integrate with heterogeneous storage systems. Moreover, all stored data from the existing WD SAN/NAS storage facilities, as part of the project deliverables, shall be seamlessly migrated to the new cluster storage.

B. APPROVED BUDGET FOR THE CONTRACT (ABC)

The Approved Budget for the Contract is **TWENTY-SEVEN MILLION PESOS (Php 27,000,000.00)** inclusive of VAT and all applicable government taxes.

C. DELIVERY PERIOD AND PLACE OF DELIVERY

The winning bidder shall deliver all hardware and software components including the delivery of the system but not limited to installation and configuration at PAGASA WFFC building located at BIR road, Diliman, Quezon City within the period of one hundred twenty calendar days (120 c.d.) commencing from the date of the issuance of the Notice to Proceed (NTP).

D. BID PROPOSAL CONTENTS

The prospective Bidders shall submit the following:

1. The prospective Bidders shall submit an Engineering Plan and Block Diagram (i.e., electrical, networking, mechanical, cooling system) of the storage system, its power supply requirement, Uninterruptible Power Supply (UPS), the grounding system and other accessories with complete sets of brochures. The Engineering Plan and Block Diagram should be duly signed by Professional Electrical Engineer.
2. To aid the Procuring Entity in its procurement planning and to ensure a sustainable and continuous operation and maintenance of the storage system, the prospective

Bidder shall be required to include in its bid proposal a list of recommended spare parts, both serviceable & disposable, with corresponding prices and guarantee of availability in the market within the next five years.

3. The prospective bidders or the manufacturer must provide of at least three (3) customer references on the proposed cluster storage system.
4. The prospective bidders must provide Gantt chart showing the proposed schedule of the delivery, installation, training, and commissioning of the project.
5. Proposed Service Level Agreement which clearly indicates the technical support tiers with the name of support personnel, position and role.
6. List of their on-site local and warm body technical support to be deployed for the project accompanied by curriculum vitae and proof of their competency such as, but not limited to diplomas and certificates.

E. TECHNICAL SPECIFICATIONS AND REQUIREMENTS

These specifications set out the requirements to be met in the supply, delivery, installation, training and commissioning of the Big Data Cluster Storage. All design, materials, manufacturing techniques & workmanship shall be in accordance with the highest accepted international standards for this type of systems.

1. SYSTEM ARCHITECTURE

Specifications
a) System features:
1) Must be fully symmetric distributed storage architecture without independent metadata nodes. The performance & capacity can linearly increase with the increase of nodes. The new nodes can balance data with the existing nodes.
2) Must support linear expansion of at least 3 to 288 nodes. New capacity and performance of added nodes must be available by at least 1 minute.
3) Must have at least 1.5PB (Petabytes) or 1500TB (Terabytes) of usable data capacity that can be scale-out to a maximum of 50 PB for future expansion.
4) Must utilize the Erasure Coding technology (at least EC:2:1) for data protection and protects data from a concurrent failure of 4 nodes.
5) Must support multiple types of interfaces such as: CIFS, NFS (v3/v4), FTP, NDMP, SMB (v1/v2/v3), HDFS (supporting interconnection with Cloudera), and Amazon S3 or OpenStack Swift interfaces.
6) Must have high performance read/write access which achieve at least 2.8 GB/s of bandwidth per node on a single disk.
7) Must support the data reconstruction rate of 1 TB/hour to ensure data reliability.
8) Must provide configurable load balancing with balancing policy that covers the CPU usage, network bandwidth, number of TCP/IP connections, round robin, and node capability value.
9) Must have a high availability & data failover operation for unimpeded access.
10) Must have a user-friendly graphical user interface dashboard or portal for administration and management.
11) Must be able to integrate or interoperate with heterogeneous storage systems.

12) Must have single set of software that centrally manages nodes, provides analysis reports, simplifies management, and improves operational efficiency.
b) Connectivity:
1) Must provide high throughput connectivity between cluster nodes and network redundancy for each node.
2) Must support 10GE, 25GE, 40GE and variety of other networking models
3) Must support Remote Direct Memory Access (RDMA) and TCP Offload Engine (TOE) to improve transmission performance.
4) Must provide high throughput and network redundancy for each node.
5) Must separate the frontend and backend network between nodes. This is to avoid bottlenecks during data reconstruction and dynamic storage tiering (DST) on frontend services.
6) Must have independent backend network interface cards (SAS, Ethernet, or InfiniBand) on nodes and switches to carry internal flows.
7) Must configure VLAN on switches, if need to be shared, to implement logical isolation and to ensure network security.
8) Must have a multi-WAN firewall router that will address network security, automatic failover, intelligent load balancing, and VPN service.

2. HARDWARE INFRASTRUCTURE

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Specifications
a) Server Node:
1) Constitute at least SEVEN SERVER NODES to form as cluster storage system
2) Each node must have at least 1 processor
3) Each node must have at least 64GB memory
4) Each node must have at least 800GB SSD for read-write cache
5) Each node must have at least 35 sets of 8TB SATA hard disk
6) Each node must have redundant power supplies
7) Must provide at least 5-year standard service warranty.
b) 10GE Switch:
1) Must provide at least TWO UNITS for cluster node network
2) Must have 48 x 10GE SFP+ downlink ports and 6 x 40 GE QSFP+ uplink ports
3) Device virtualization must support iStack, M-LAG, SVF
4) Switching capacity must have at least 1.44 Tbit/s
5) Forwarding rate must have at least 1080 Mpps
6) Layer2 feature must support 4K VLAN, QinQ, MUX VLAN, GVRP
7) IP routing must support IPv4 routing protocols, such as RIP, OSPF, BGP, and IS-IS, and IPv6 routing protocols, such as RIPng, OSPFv3, IS-ISv6, and BGP4+
8) Must support LACP, STP, RSTP, VBST, MSTP, Smart Link and multi-instance, Hardware-based Bidirectional Forwarding Detection (BFD), VRRP, VRRP load balancing, and BFD for VRRP
9) Must include all accessories and cable patches
10) Must provide at least 5-year standard service warranty.
c) 1GE Switch

1) Must provide at least ONE UNIT for cluster management network.
2) Must have at least 48 x 1GE Base-T downlink ports, 4 x 10GE SFP+ uplink ports, and 2 x 40GE QSFP+ ports.
3) Device virtualization must support iStack, M-LAG, SVF.
4) Switching capacity must have at least 336 Gbit/s.
5) Forwarding rate must have at least 252 Mpps .
6) Layer2 feature must support 4K VLAN, QinQ, MUX VLAN, GVRP.
7) IP routing must support IPv4 routing protocols, such as RIP, OSPF, BGP, & IS-IS, and IPv6 routing protocols, such as RIPng, OSPFv3, IS-ISv6, and BGP4+.
8) Must support LACP, STP, RSTP, VBST, MSTP, Smart Link and multi-instance, hardware-based Bidirectional Forwarding Detection (BFD), VRRP, VRRP load balancing, and BFD for VRRP.
9) Must include all accessories and cable patches.
10) Must provide at least 5-year standard service warranty.
d) Data Cabinet:
1) Must include ONE UNIT of 42U server rack cabinet.
2) Must be industry standard, adjustable 19" rack with square mounting holes.
3) Must have perforated, lockable front and rear doors including side panels.
4) Must have removable side panels with quick release hinges.
5) Rear cable management channels must have space for mounting 0U strips PDUs (power distribution units) and vertically mounted.
6) Must have anti-tilt bars and levelling feet
7) Must have KVM console for server management.
8) Must provide at least 3-year standard service warranty.
e) UPS Power System
1) Must include ONE SET of Uninterruptible Power Supply (UPS) subsystem.
2) Must provide a minimum system backup time of at least 15 minutes.
3) Must have at least 20KVA full load capacity or the KVA rated capacity will depend on the total power requirement of the system offered.
4) Must provide at least 3-year standard service warranty.
f) Multi-WAN Router
1) Must include ONE SET of Multi-WAN router 1U with WAN load balancing features of at least 7 link load balancing algorithms & customizable rules
2) Must have 3 GE WAN ports and 3 GE LAN ports
3) Must have automatic network failover, LACP NIC bonding, port-based VLAN, bonded VPN, and per-user bandwidth control
4) Must have network security features such as URL logging, content blocking, guest protection of subnets, stateful firewall throughput of at least 1Gbps
5) Must have IPSec/L2TP/PPTP VPN functionality with at least 20 IPSec tunnels
6) Must provide at least 1-year standard service warranty.
g) Mobile Laptop
1) Must include THREE SETS of mobile laptops for remote system administration.
2) Must have at least 8th Generation Intel® Core™ i7 processor.
3) Must have at least 15" IPS FHD (1920 x 1080) antiglare display.
4) Must have at least 32GB DDR4 memory.
5) Must have at least 500GB PCIe M.2 SSD.

6) Must include laptop casual backpack with water-repellent fabric, padded laptop compartment and other quick-access compartments.
7) Must provide at least 1-year standard service warranty.
h) SATA Hard Drives
1) Must include 36 UNITS of at least 8TB SATA hard drives (preferred Seagate Exos Enterprise or any hardwearing, heavy-duty brand of server-grade hard disk).
2) Must provide of at least 1-year standard replacement warranty.

F. INTEGRATION OF LEGACY STORAGE SERVERS

1. With the assistance of Weather Division technical support and the storage server admins, the winning bidder must install and setup the 36 units of hard drives to the 2 sets of legacy storage servers for capacity expansion.
2. After installation and setup, the 2 sets of legacy storage servers with expanded capacity shall be connected to the cluster storage network.
3. After establishing the network connection between legacy storage server and cluster storage, existing data files stored in legacy storage server must be migrated to the newly installed cluster storage system.
4. Any parts, modules, cables, & services needed for the connectivity & data migration activity must be shouldered by the winning bidder.

G. NETWORKING AND DATA CABLING

The prospective bidder shall supply all necessary networking peripherals and accessories for the connectivity of the system to the Weather Division local area network (LAN).

H. ELECTRICAL SYSTEM

The prospective bidders shall coordinate with the electrical group of PAGASA Engineering and Technical Services Division (ETSD) regarding the electrical system requirements before submitting the required Engineering Plan and Block Diagram.

I. FACTORY ACCEPTANCE TEST (FAT) AND FACTORY TRAINING

The Factory Acceptance Test (FAT) shall be conducted at the nearest factory site of the Cluster Storage system, to be witnessed and accepted by three (3) PAGASA personnel from middle and/or top management staff. The FAT shall be conducted within a total of five (5) calendar days. Simultaneously, a 5-day Factory Training on Cluster Storage system management and maintenance shall also be conducted and to be attended by three (3) qualified technical personnel of PAGASA who are directly involved in the safekeeping of WD data files and maintaining the WD data storage facilities.

All related expenses during the FAT and Factory training, such as, but not limited to, round trip airfare, local transportation, lodging/accommodation, training materials and allowable travel expenses based on the prevailing UNDP-DSA rates for each participant shall be borne by the Winning Bidder.

J. SITE ACCEPTANCE TEST (SAT) AND ON-SITE TRAINING

Site Acceptance Test (SAT) shall be conducted on-site. The purpose of the test is to verify the performance of the system in accordance with the specifications and functional requirements. The series of tests must be based on detailed checklist test provided by the winning bidder and to be performed by the technical team of the end-user. Any defect or deviation discovered during the site acceptance test shall be rectified by the Winning Bidder immediately or within a maximum period of one (1) month after the completion of test. After such rectification, another testing shall be made to verify the rectification. The SAT shall be witnessed and accepted by PAGASA personnel, two (2) from middle management staff and one (1) from top management staff.

Moreover, a 5-day hands-on end-users training on Cluster Storage system shall also be conducted onsite. All expenses related to the on-site training, including meals shall be provided by the Winning Bidder and to be attended by at least five (5) WD personnel and ~~or~~ end-users.

K. SYSTEM COMMISSIONING

After the satisfactory conclusion of the Site Acceptance Test, the Winning Bidder shall show and demonstrate the capability and performance of the operational Cluster Storage system displaying the enabled features of efficient data safekeeping, archiving and backup. Acceptance test shall also be conducted on switches, router, and UPS. The successful demonstration based on acceptance checklist thereof, shall mean that storage cluster system has been commissioned.

L. WARRANTIES

All workmanship, system parts, accessories, other materials and equipment and services shall be warranted by the Winning Bidder and shall have 5-year maintenance support services warranty server nodes and switches, 3-year standard warranty on server rack cabinet and UPS, and 1-year standard warranty on Multi-WAN router, mobile laptop and hard drives. It shall also include the following:

1) Software and firmware updates, replacement of parts or the units itself, repair and troubleshooting within the respective subscription period.
2) Availability of Technical Support services 24/7 via telephone, text, and email which include Remote Access Assistance thru Internet web or VPN access.
3) Prospective bidders shall provide the end-user a copy of the Service Level Agreement (SLA) clearly indicating the technical support tiers.

M. AFTER SALES SUPPORT

The Winning Bidder shall include in its bid a commitment for at least five (5) years support to PAGASA for the repair and maintenance of the equipment to be supplied specifically the server nodes and switches. It shall include in its commitment a provision of a reliable, swift and efficient on-site 24/7 support, availability of ticketing and response system, and ensure a quick

and readily available supply of spare and replacement parts especially for the storage nodes where the data resides.

N. SYSTEM DOCUMENTATION

The Winning Bidder shall provide installation, operations and maintenance manuals to the end-user. The manuals shall also include the system configuration of the nodes, switches and routers. It shall also contain among others the complete and detailed schematic diagrams, theory of operations, calibration and maintenance procedures. All other hardware and software requirements shall also be turned-over to PAGASA prior to the issuance of the Final Inspection and Acceptance report. In addition, the Winning Bidder shall provide a complete list of deliverables and installation materials.