



TERMS OF REFERENCE

For the

SUPPLY, DELIVERY, INSTALLATION, TRAINING, TESTING AND COMMISSIONING OF ADVANCED DATA ANALYTICS SYSTEM ENHANCEMENT

A. OBJECTIVE

Commissioned in 2020, the Advanced Data Analytics System (ADAS), project implemented by the Weather Division represents a significant advancement in meteorological forecasting through the integration of high-performance computing (HPC) and artificial intelligence (AI). This GPU-based HPC facility employs cutting-edge techniques such as machine learning, predictive modeling, and neural networks to analyze complex datasets, uncover patterns, and generate forecasts about future weather conditions. The system can process vast amounts of data from various sources, including weather satellites and real-time meteorological information from ground stations. Utilizing machine learning techniques allows continuous improvement in forecasting capabilities, adapting to new data, and evolving patterns in weather behavior. The initial ADAS outputs include two notable AI-driven products: the error correction model for rainfall forecasting and an automated rainfall prediction system that utilizes observed data alongside satellite imagery.

The project aims to provide additional high-performance GPU nodes to enable the ADAS to run larger-scale AI models and to integrate with high-core density compute nodes. The integration will allow ADAS to execute traditional CPU-based numerical weather prediction models, particularly the WRF (Weather Research & Forecasting) model, which is currently managed by the Numerical Model Section (NMS) of the Research, Development, and Training Division (RD TD) at the HPC facility of NMS. The aging iHPC, commissioned in 2010, is now facing several hardware issues; these outdated components are incompatible with the latest version of WRF. As the demand for advanced computational power continues to grow, enhancing the ADAS will become increasingly essential in the development of next-generation AI/HPC solutions for weather models, and can facilitate scalability and future-proofing of PAGASA AI/HPC environments.

In conclusion, the ADAS project stands as a pioneering initiative in harnessing the power of AI and machine learning to transform how weather data is analyzed and utilized. As the system continues to evolve, it holds the potential to significantly enhance the understanding of weather phenomena and improve the accuracy of forecasts, ultimately contributing to better preparedness and response strategies in an increasingly unpredictable climate.

B. APPROVED BUDGET FOR THE CONTRACT (ABC)

The Approved Budget for the Contract is **SIXTY-NINE MILION FIVE HUNDRED NINETY THOUSAND SIX HUNDRED TWENTY-FOUR PESOS (PHP 69,590,624.00)** only 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 configurations, testing, and commissioning at PAGASA WFFC Building on BIR road, Quezon City within **ninety calendar days (90 c.d.)** commencing from the date of issuance of the Notice to Proceed (NTP).

D. TECHNICAL SPECIFICATIONS AND REQUIREMENTS

The following are the minimum requirements for the supply, delivery, installation, training, testing, and commissioning of the enhanced ADAS (AI/HPC) facility of the Weather Division.

a. HARDWARE SPECIFICATIONS

The computing hardware must conform to the following minimum specifications:

1) ONE (1) SET OF MASTER LOGIN NODE

- 1.1. 2 x AMD EPYC 9335 32C 210W 3.3GHz Processor
- 1.2. 24 x 16GB (384GB) TruDDR5 6400MHz RDIMM-A RAM
- 1.3. 2 x 2.5" 5400 PRO 1.92TB x 2 Read Intensive SATA 6Gb HS SSD
- 1.4. 1 x RAID 5350-8i PCIe 12Gb Internal Adapter
- 1.5. 1 x Intel I350 1GbE RJ45 4-Port OCP Ethernet Adapter V2
- 1.6. 1 x Mellanox ConnectX-6 HDR/200GbE QSFP56 1-port PCIe 4 VPI Adapter
- 1.7. 2U 24x2.5" Chassis and Toolless Side Slide Rail Kit
- 1.8. 2U 8x2.5" SAS/SATA Backplane
- 1.9. 2U x16/x16/E PCIe Gen5 Riser1 or 2
- 1.10. Platform Secure Boot Enable, TPM 2.0, Enable IPMI-over-LAN
- 1.11. 2 x 1100W 230V Platinum Hot-Swap power supply & Toolless Slide Rail Kit
- 1.12. With a high-performance CPU and chassis air-cooling system
- 1.13. With complete interconnection (optical/copper) and power cables, fillers
- 1.14. *SOFTWARE: Enterprise Linux operating system (OS) with Manufacturer support, cluster management software for compute nodes and other management application tools*
- 1.15. *With a 3-year warranty on parts, support and services*

2) ONE (1) SET OF HIGH-PERFORMANCE GPU COMPUTE NODES

- 2.1. 2 x NVIDIA H100 NVL 94GB PCIe Gen5 Passive GPU
- 2.2. 2 x AMD EPYC 9334 32C 210W 2.7GHz Processor
- 2.3. 24 x 32GB (768GB) TruDDR5 4800MHz (2Rx8) RDIMM-A RAM
- 2.4. 2 x 2.5" U.2 P5520 1.92TB Read Intensive NVMe PCIe 4.0 x4 HS SSD
- 2.5. 2 x M.2 7450 PRO 960GB Read Intensive NVMe PCIe 4.0 x4 NHS SSD
- 2.6. 3 x NVIDIA Ampere NVLink 2-Slot Bridge
- 2.7. 1 x 2U 8x2.5" AnyBay Gen5 Backplane and M.2 NVMe 2-Bay RAID Adapter
- 2.8. 2 x Mellanox ConnectX-6 HDR/200GbE QSFP56 1-port PCIe 4 VPI Adapter
- 2.9. 1 x I350-T4 PCIe 1Gb 4-Port RJ45 Ethernet Adapter
- 2.10. 1 x Intel I350 1GbE RJ45 4-port OCP Ethernet Adapter
- 2.11. 2 x 100Gb SR4 QSFP28 Ethernet Transceiver
- 2.12. With 2x x16 PCIe Front and Rear IO Riser, and Direct 4x16 PCIe DW GPU Riser
- 2.13. 2 x 2600W 230V Titanium Hot-Swap Gen2 Power Supply
- 2.14. 1 x Direct 4x16 PCIe DW GPU Riser
- 2.15. 2 x 2600W 230V Titanium Hot-Swap Gen2 Power Supply & Toolless Slide Rail Kit
- 2.16. With a high-performance CPU and chassis air-cooling system
- 2.17. With complete interconnection (optical/copper) and power cables.

- 2.18. SOFTWARE: Enterprise Linux operating system (OS) with Manufacturer support, cluster management software for compute nodes and other management application tools
- 2.19. With a 3-year warranty on parts, support and services

3) FIVE (5) SETS OF HIGH CORE DENSITY COMPUTE NODES

- 3.1. 2 x AMD EPYC 9745 128C 400W 2.4GHz Processor
- 3.2. 24 x 32GB (768GB) TruDDR5 6400MHz (2Rx8) RDIMM-A RAM
- 3.3. 2 x 2.5" 5400 PRO 960GB Read Intensive SATA 6Gb HS SSD
- 3.4. 1 x RAID 5350-8i PCIe 12Gb Internal Adapter
- 3.5. 1 x Intel I350 1GbE RJ45 4-Port OCP Ethernet Adapter V2
- 3.6. 1 x Mellanox ConnectX-6 HDR/200GbE QSFP56 1-port PCIe 4 VPI Adapter
- 3.7. 2U 24x2.5" Chassis with Toolless Side Slide Rail kit
- 3.8. 2U 8x2.5" SAS/SATA Backplane, and x16/x16/E PCIe Gen5 Riser1 or 2
- 3.9. Platform Secure Boot Enable, TPM 2.0, Enable IPMI-over-LAN
- 3.10. 2 x 1800W 230V Platinum Hot-Swap power supply
- 3.11. With high-performance CPU and chassis air-cooling system
- 3.12. With complete interconnection (optical/copper) and power cables.
- 3.13. SOFTWARE: Enterprise Linux operating system (OS) with Manufacturer support, cluster management software for compute nodes and other management application tools
- 3.14. With a 3-year warranty on parts, support and services

4) TWO (2) SETS OF STORAGE IO NODES

- 4.1. 2 x AMD EPYC 9454P 48C 290W 2.75GHz Processor
- 4.2. 12 x 64GB (768GB) TruDDR5 4800MHz (2Rx4) 10x4 RDIMM-A RAM
- 4.3. 2 x 2.5" PM1655 800GB Read Intensive SATA 6Gb HS SSD
- 4.4. 1 x RAID 940-16i 8GB Flash PCIe Gen4 12Gb Internal Adapter
- 4.5. 1 x Broadcom 57454 10GBASE-T 4-port OCP Ethernet Adapter
- 4.6. 2 x NVIDIA ConnectX-7 NDR200/200GbE QSFP112 2-port PCIe Gen5 x16 Adapter
- 4.7. 2U 24x2.5" Chassis and Toolless Side Slide Rail Kit
- 4.8. 2U 8x2.5" SAS/SATA Backplane and 2U x16/x16/E PCIe Gen5 Riser1 or 2
- 4.9. Platform Secure Boot Enable, TPM 2.0, Enable IPMI-over-LAN
- 4.10. 2 x 1800W 230V Titanium Hot-Swap power supply
- 4.11. With a high-performance CPU and chassis air-cooling system
- 4.12. With complete interconnection (optical/copper) and power cables.
- 4.13. *SOFTWARE: Enterprise Linux operating system (OS) with Manufacturer support, cluster management software for compute nodes and other management application tools*
- 4.14. With a 3-year warranty on parts, support and services

5) ONE (1) LOT OF HIGH-DENSITY DIRECT-ATTACHED STORAGE

- 5.1. 4U JBOD Chassis with Dual 12/24Gb SAS standard (active/active fail-over)
- 5.2. Minimum USABLE data storage capacity must be 1.4 PB
- 5.3. 2 x 2.5 800GB 3DWD SAS SSD for OS & Cache
- 5.4. 88 x 22TB 3.5" SED 7.2K rpm NL-SAS HDD for data storage
- 5.5. RAID Support: RAID-0, 1, 10, 5, 50, 6, 60 (Host controller-dependent)

- 5.6. Host Controllers Supported: RAID 940-8e PCIe 12Gb Adapter, 440-16e SAS/SATA PCIe Gen4 12Gb HBA, and 440-8e PCIe 12Gb SAS/SATA HBA
- 5.7. Back Panel Connectors: 4x 24Gbps Mini-SAS HD (SFF-8644) ports each expansion module
- 5.8. Hot-swap/redundant power supplies and hot-swap/redundant fans
- 5.9. With a high-performance chassis air-cooling system
- 5.10. With complete interconnection (optical/copper) and power cables.
- 5.11. With a 3-year warranty on parts, support and services

6) EIGHT (8) SETS OF HIGH-END DESKTOP WORKSTATIONS

- 7) Processor 14th Generation Intel® Core™ i9-14900 vPro
 - 7.1. Memory: 2 x 16 GB DDR5-4400MHz (UDIMM)
 - 7.2. Hard drive 1TB GB Solid State Drive M.2 2280 PCIe Gen4
 - 7.3. NVIDIA® RTX™ A1000 (8GB GDDR6) or equivalent VRAM
 - 7.4. Integrated Intel Gigabit Ethernet RJ45 port or equivalent
 - 7.5. Intel Wireless-AC9560 2x2 AC + Bluetooth 5.0 or equivalent
 - 7.6. Two (2) sets of LED-backlit LCD monitor 22", Full HD 1920 x 1080
 - 7.7. USB keyboard, English, black, and USB optical mouse (pad included), black
 - 7.8. USB Stereo Headset with built-in noise-canceling mic and easy call management and audio clarity for optimized voice call
 - 7.9. Full HD Webcam with resolution of up to 1920 x 1080, frame rate up to 30 FPS, pixels 2 million, view angle at least 83°, USB 2.0 interface
 - 7.10. Includes with UPS with surge protector, 650VA, Nominal input voltage 230V, Input frequency 50/60Hz +/-1Hz (Auto-sensing), maintenance-free sealed battery
 - 7.11. Software installed: *Windows 11 Pro 64 English, Office Home & Business 2021 (one-time purchase), licensed & latest version of PDF reader*
 - 7.12. With a 1-year hardware warranty including support & services

8) FIVE (5) SETS OF MOBILE LAPTOP

- 8.1. Processor: Intel Core™ Ultra 7 165H Processor with vPro or better
- 8.2. Operating System: Windows 11 Pro 64 or the latest Windows variant
- 8.3. Graphic Card: NVIDIA® RTX™ 1000 ADA (6GB GDDR6 VRAM) or equivalent GPU
- 8.4. Memory: 16 GB LPDDR5X-7500MHz
- 8.5. Hard Drive (OS): 1TB M.2 PCIe Gen4 NVMe Performance SSD
- 8.6. Hard Drive (External): 2TB Portable 2.5-inch Solid State Drive USB 3.0, Plug & Play
- 8.7. Display: 16" WUXGA (1920 x 1200) IPS, 16:10 aspect ratio, 300 nits, antiglare, 45%NTSC
- 8.8. Camera: 1080p FHD with webcam privacy shutter
- 8.9. Battery 90Whr battery, Rapid Charge (60 minutes = 80% capacity) with 135W
- 8.10. Ports/Slots: USB-A, 2 x USB-C® (Thunderbolt™ 4, USB 40Gbps), Ethernet (RJ45), HDMI® 2.1
- 8.11. WIFI: Intel® Wi-Fi 6E AX211 2x2 AX & Bluetooth® 5.1/ Bluetooth® 5.3
- 8.12. Software: Office Home & Business 2021 (one-time purchase), licensed PDF reader
- 8.13. Accessories: Wireless mouse (Logitech) 3-button 2.4Ghz, Laptop backpack
- 8.14. With a 1-year hardware warranty including support and services

9) EIGHT (8) SETS OF DESKTOP NETWORK-ATTACHED STORAGE (NAS)

- 9.1. Must be a Linux-based operating system with an intuitive, user-friendly web interface
- 9.2. Processor AMD Ryzen R1600 2C 2.6 (base) / 3.1 (turbo) GHz or equivalent
- 9.3. Memory 4 GB DDR4 ECC SODIMM or better
- 9.4. Hard drive 10TB x 4, RAID 5, Usable data capacity of at least 30TB
- 9.5. Compatible with 3.5" SATA HDD, 2.5" SATA SSD, M.2 2280 NVMe SSD
- 9.6. External ports: RJ-45 1GbE LAN Port, USB 3.2 Gen 1 Port
- 9.7. File Protocol: SMB, AFP, NFS, FTP, WebDAV, and Rsync
- 9.8. Supported Protocols: SMB1 (CIFS), SMB2, SMB3, NFSv3, NFSv4, NFSv4.1, NFS Kerberized sessions, iSCSI, HTTP, HTTPS, FTP, SNMP, LDAP, CalDAV
- 9.9. File System Internal Drives: BTRFS, ext4
- 9.10. File System External Drives: BTRFS, ext4, ext3, FAT, NTFS, HFS+, exFAT
- 9.11. With a 1-year hardware warranty, including support and services

10) FIVE (5) SETS OF INK TANK PRINTER

- 10.1. Multifunctional, all-in-one printer (Print, Scan, and Copy).
- 10.2. Designed to scan and copy paper sizes of Legal and Folio.
- 10.3. Supports automatic 2-sided printing (up to A4 / Letter)
- 10.4. Prints up to A3+ size with auto duplex printing and high-capacity ink tanks.
- 10.5. Print maximum resolution is 4800 x 1200 dpi, copy maximum resolution is 600 x 600 dpi, and scan optical resolution is 1200 x 2400 dpi.
- 10.6. Number of paper trays: 2 (Front 1, Rear 1) with friction paper feed method.
- 10.7. Paper Sizes: A3, A3+, Super B, US B (11 x 17"), Legal, Letter, A4, Executive, B4, B5, A5, B6, A6, Folio 8.5 x 13", Half-Letter, Envelopes: #10, DL, C6, C4
- 10.8. Supports Ethernet, Wi-Fi IEEE 802.11b/g/n, Wi-Fi Direct, and USB 2.0
- 10.9. With LCD Touch Screen display or similar
- 10.10. With an additional 5 sets of original black, cyan, magenta & yellow ink refills.
- 10.11. With 1 box of A4 and Folio each, ultra white, 120 GSM
- 10.12. With a 1-year hardware warranty, including support and services

b. SOFTWARE/APPLICATION REQUIREMENTS

The computing software and application tools must conform to the following features and capabilities:

a) COMMERCIAL ENTERPRISE LINUX OPERATING SYSTEM

- (1) A fully supported production-grade Operating System (OS)
- (2) Includes built-in security features like live kernel patching, security profiles, security standards certification, and a trusted software supply chain.
- (3) Proactive support in providing notifications of software updates, security advisories, and errata including bug fixes and enhancements.
- (4) The OS must have full support from the hardware manufacturer to optimize performance and enhance security.
- (5) Must have a 3-year warranty on software updates and support

b) CLUSTER MANAGEMENT SOFTWARE FOR HIGH-PERFORMANCE COMPUTING (HPC) AND ARTIFICIAL INTELLIGENCE (AI) ENVIRONMENTS

- (1) Must be a browser-based, single interface for user login in a graphical environment to deploy, monitor, and manage AI/HPC workloads. The Graphical User Interface (GUI) is to help eliminate complexity for non-technical users.
- (2) Provide dashboards to monitor the usage of cluster resources, including CPU, memory, storage, and network.
- (3) Must provide cluster management and monitoring, job scheduling/management, cluster user management, account management, and file system management.
- (4) Users with administrator privileges should manage and monitor users, user groups, jobs, alerts, and reports within a cluster in a centralized manner.
- (5) Users can directly view and manage the status and results of jobs.
- (6) Must have an Expert Mode option to give expert users a command-line tool to submit and manage jobs.
- (7) Must have a 3-year warranty on software updates and support

c) SERVER MANAGEMENT APPLICATION TOOLS

- (1) The software package is developed and supported by the manufacturer to manage, monitor, and operate with granularity scale-out server configurations.
 - (a) Console Management: Allows multi-user access, full logging, and VT-aware buffering.
 - (b) Hardware Control: Manage essential operations like power on/off, BIOS/UEFI settings, and hardware storage configurations.
 - (c) OS Deployment: Supports deployment over PXE, HTTP(S) boot, or removable media, with customization options during various deployment phases.
 - (d) Network Management: Centralized access to network topology information and device onboarding capabilities.
 - (e) Scalability and Availability: designed to manage thousands of systems with high availability and powerful data analysis tools.
 - (f) Security: Incorporates secure default behaviors, TPM2 support, and flexible node authentication options.
- (2) Manufacturer suite of management tools designed to simplify and automate maintenance of the cluster hardware infrastructure.
 - (a) A centralized resource management solution that reduces complexity, speeds up response time and enhances the availability of server systems.
 - (b) Provides functionalities like firmware updates, hardware monitoring, and configuration management.
 - (c) Ready for hybrid cloud-based unified Management-as-a-Service (MaaS) platform.
 - (d) Utilizes AI-driven predictive analytics to improve the new cluster system's overall performance, reliability, and efficiency.
- (3) Have a 3-year warranty on software updates and support

d) WEATHER MODEL INSTALLATIONS

- (1) Weather Research and Forecasting (WRF)
A community-based and freely downloadable mesoscale numerical weather prediction model designed for atmospheric research and operational forecasting applications. It can simulate atmospheric processes at various scales, from fine mesoscale features (like storms) to larger synoptic patterns, making it suitable for a range of applications.

(2) Model for Prediction Across Scales (MPAS)

It is a numerical modeling framework designed for simulating weather and climate across various spatial and temporal scales. Developed to address the limitations of traditional weather prediction models, MPAS uses a variable-resolution mesh that allows for high-resolution simulations in regions of interest while retaining coarser resolution elsewhere. This adaptability enables more efficient and accurate modeling of complex atmospheric phenomena.

(3) European Centre for Medium-Range Weather Forecasts (ECMWF)

AI-based weather forecasting models designed for medium-range predictions. It utilizes advanced data assimilation techniques to combine observational data (from satellites, weather stations, buoys, etc.) with the model forecasts to create an accurate initial state of the atmosphere and emphasizes advanced modeling techniques for accurate forecasting.

E. SCOPE OF WORKS

The Winning Bidder shall perform the following:

1. Enhancement of the existing GPU-based Cluster system.
 - a. To install and configure commercial enterprise Linux OS (Operating System) in the latest stable version to upgrade the OS of existing server nodes (7 units) in the cluster system.
 - b. Update the existing login node, visualization node, GPU-based compute nodes, and storage IO servers to match the provider's best-recommended AI-enabled setup and configuration.
 - c. At the master login node, update the browser-based cluster management software for deploying, monitoring, and managing AI/HPC workloads.
 - d. Check and update existing high-density, direct-attached storage.
 - e. Check and update existing InfiniBand (IB), Ethernet networking, and other cluster network components.
 - f. Install a centralized software suite of management tools to provide functionalities like firmware updates, hardware monitoring, and configuration management.
 - g. Provide a 3-year software warranty for updates (bug/security fixes), support, and services.
 - h. Provide a 3-year post-warranty service on hardware on EXISTING server nodes (7 units) in the cluster system with the following serial numbers: J301XNNV, J301XNNW, J301XNNX, J301XNNY, J301Y6Z4, J301Y6Z5, and J301Y6Z6.
2. Installation and integration of additional GPU-based and CPU-based compute nodes to the existing AI/HPC Cluster system.
 - a. Install the commercial enterprise Linux OS supported by the Manufacturer, to all new server nodes of the Cluster system.
 - b. Integrate the new login, CPU nodes, and storage IO servers to the existing Cluster's InfiniBand (IB) and Ethernet networking system.
 - c. The login, GPU, CPU, and IO node servers are set up according to the Manufacturer's best-recommended HPC configuration.
 - d. Install complete supported software needed for server clustering and HPC computing.
 - e. Install a new high-density, direct-attached storage for HPC simulations, object storage, big data and analytics, and backup/archiving.

- f. Install a single interface for users to deploy, monitor, and manage AI/HPC workloads in graphical environments for the secondary login node.
 - g. Install a centralized software suite of management tools to provide functionalities like firmware updates, hardware monitoring, and configuration management.
 - h. Provide a 3-year software warranty for updates (bug/security fixes), support, and services.
 - i. Provide a 3-year hardware warranty on parts, support, and services on the NEW server nodes (9 units) including DAS storage to be added to the cluster system.
- 3. Installation of Weather Research & Forecasting Model (WRF)
 - a. Download and set up the WRF model on the new AI/HPC cluster system.
 - b. Configure the installed application based on the needs of the WRF modeling group.
 - c. Conduct testing and a series of modeling simulations relevant to weather forecasting. The activity must include pre-processing, domain configuration, post-processing, visualization, and verification.
- 4. Reinstallation of the existing ADAS model
 - a. Integration of other satellite images like GK-2A(GEO-KOMPSAT-2A). The GK-2A is a Korean satellite that can generate a 10-minute interval data.
 - b. Optimization of real-time data ingestion to be used for machine learning.
 - c. Enhancement of user accessibility through an intuitive dashboard with automated alerts and API capable integration.
- 5. Technology transfer and other post-installation activities.
 - a. Conduct a series of performance and benchmarking tests on the newly enhanced GPU/CPU cluster system. Test results will be included in the final acceptance of the cluster system.
 - b. Conduct onsite (hands-on) workshops and relevant F2F/online training for all installed HPC software and applications.
 - c. Submit comprehensive documentation, including relevant certificates (warranties, workmanship, etc.) of the completed cluster system.

F. SERVICE LEVEL AGREEMENT

Three (3) Years Warranty with Preventive and Remedial Services

A 3-year warranty with preventive and remedial services is required on all delivered goods and shall take effect upon issuance of the Certificate of Final Acceptance. Said warranty shall include, as follows:

1. The winning bidder must warrant that if any improvements are announced for the proposed product or its components between the submission of proposals and the implementation date, the Service Provider will deliver and install the improved product or components at the PAGASA without affecting the contract amount.
2. PAGASA should be entitled to receive all applicable software version updates (including operating systems and bundled software), security patches, and feature packs at no additional cost.
3. The Service Provider shall provide onsite technical support on all delivered products and their components.

4. The Service Provider shall utilize experienced and trained technicians or technical support personnel under its supervision in rendering the required remedial service. Hence, the winning Supplier is required to provide a list of support personnel with detailed resume on experience and training
5. Spare parts shall be available 24 x 7 to replace defective units or parts.
6. Support services shall be available 7 x 24 x 4
7. Service units shall be provided if a technical issue has not been resolved within 48 hours.
8. All technical support shall be available locally. Technical support from abroad shall be allowed if it can meet the required SLA for support.
9. The winning bidder must have Helpdesk System Support to handle PAGASA technical support requests, providing a ticket for each issue and issuing status reports until resolution. The Helpdesk System Support must be operational 24/7, including holidays, and should provide notification options for technical assistance via email and telephone/smartphone.
10. Within four (4) hours upon receipt of a request for support, either through phone, email, or in writing, the Service Provider shall address the problem by making a phone call to the concerned PAGASA unit. If the problem persists, the Service Provider shall address the problem onsite.

G. ADDITIONAL REQUIREMENTS

To ensure smooth and organized project implementation activities, including technology transfer, systems operation, and maintenance of the enhanced cluster system, the winning Bidder shall submit the following:

- 1) A project management plan detailing activities and timelines, such as a Gantt chart, illustrating the proposed delivery schedule, installation, testing, and project turnover. Ensure the conduct of necessary meetings with end-users and technical support personnel from kick-off to final wrap-up. The winning Bidder must cover meals during the onsite meetings.
- 2) A Service Level Agreement (SLA) that clearly defines the level of service, indicating the technical support tiers, including the names of support personnel, their positions, roles, and respective contact numbers and email addresses.
- 3) A list of on-site local and warm-body technical support personnel to be deployed for the project, accompanied by curriculum vitae and proof of their competency, such as diplomas and certificates. The list of technical support personnel must include certified engineers/technicians who are highly knowledgeable about the proposed storage system.
- 4) A Service Level Agreement (SLA) that clearly defines the level of service, indicating the technical support tiers, including the names of support personnel, their positions, roles, and respective contact numbers and email addresses.
- 5) To provide quality and efficient knowledge to training participants, trainers must have solid working knowledge, extensive experience, and skills related to the training topic they will teach. Consequently, they must submit documented experience and skills pertinent to the training

Additionally, to ensure compliance with the technical specifications and requirements outlined in these Terms of Reference, the Prospective Bidder shall provide the following:

- 6) A certification from the Distributor/Dealer stating that the Manufacturer has authorized the Prospective Bidder to supply the items and that the items fully comply with all required specifications.
- 7) A certification from the Manufacturer confirming that they are the manufacturer of the item/s to be supplied and that the items have fully complied with all required specifications.

H. ELECTRICAL AND DATA NETWORKING

The existing ADAS facility is now situated at the newly commissioned Modular Data Center (MDC), which is already accessible to users on the WFFC/CAD building LAN. Given that the MDC has sufficient and stable power and cooling systems, the new cluster nodes will be installed at the MDC and integrated into the existing ADAS internal network. Moreover, the newly established modular data center's uninterruptible power supply (UPS) will provide the power needs of the new computing system. The Winning Bidder will shoulder all expenses incurred in installing needed networking and electrical peripherals, accessories, modules, and cables. Prospective Bidders are advised to conduct an ocular visit to the modular data center at the PAGASA WFFC compound, where the equipment will be installed.

I. TRAINING REQUIREMENTS

To provide knowledge and proficiency, the Winning Bidder must provide comprehensive training for personnel who manage, monitor, and maintain the new AI/HPC system. The participants, recommended by WD, must have a solid background and working experience in maintaining high-performance computing or cluster systems. The workshop sessions can be conducted face-to-face, virtual online, or in a hybrid environment. If the workshop is in live interaction, the Winning Bidder must provide the participants with training materials and meals (and transportation if conducted outside the PAGASA office). If it is in a virtual environment, the Winning Bidder must provide the training participants with voucher meals.

The training workshops shall include the following: **(1)** ADAS System Administration - the 2-day training is to upskill the working knowledge of WD personnel who will manage the hardware and software of the system relevant to the installed enterprise Linux OS and infrastructure management software AI/HPC. **(2)** ADAS Users (Developers/Modelers) Training - the 3-day workshop is to provide the attendees the knowledge of deploying and managing AI/HPC workloads using GUI and terminals. The workshop training agenda shall include the installation of WRF and WPS, pre-processing and domain configuration, optimization, post-processing, visualization, and verification. Both trainings require a minimum attendance of 8 participants, and a certificate of completion must be issued after each training.

Moreover, the Winning Bidder shall also provide self-paced, or intensive online training (with exercise labs) to 15 qualified PAGASA personnel, from online course providers on Python (Basic/Advanced), PyTorch, TensorFlow, Onnx, and other relevant training modules on AI tools. This is to help PAGASA personnel to learn and enhance their technical knowledge of various Artificial Intelligence (AI) tools and applications.

J. FACTORY ACCEPTANCE AND TRAINING

The Winning Bidder shall conduct a 5-day Factory Acceptance Test (FAT) at the manufacturer's factories or facilities site and witnessed by three (3) personnel from the Weather Division's top or middle management staff including four (4) key/technical staff that directly managing the ADAS facility for the training. The activity shall include an advanced workshop on AI-guided HPC simulations (focused on the WRF model to run on GPU-

based HPC systems) and ML (Machine Learning) deployment strategies including system management of the AI/HPC facility. All related expenses, such as round-trip airfare, transportation, lodging/ accommodation, and daily allowances (based on UNDP rates) for each participant shall be shouldered by the winning bidder.

K. SYSTEM COMMISSIONING AND DOCUMENTATION

The Site Acceptance Test (SAT) will be conducted at the new modular data center within the Weather and Flood Forecasting Center (WFFC) compound. The SAT aims to verify the operability and performance of the new cluster system and ensure that it conforms with the specifications and functional requirements detailed in this TOR. The Winning Bidder shall present, operate, and demonstrate the capability and performance of the newly commissioned system facility. A series of tests must be executed by the WD technical team and AI/HPC end-users based on a comprehensive checklist provided by the Winning Bidder. The SAT must be observed by middle or top management staff from the WD, who, upon the satisfactory completion of the SAT, will confirm that the system has been successfully commissioned.

Furthermore, the Winning Bidder shall provide complete installation, operation, and maintenance manuals. The manuals shall include the system configuration of the software and hardware packages. They shall also contain, among other things, complete and detailed diagrams and systems management procedures. All other relevant documents about the project shall also be turned over to PAGASA before the issuance of the Final Inspection and Acceptance report

L. WARRANTIES AND AFTER-SALES SUPPORT

All workmanship, system components, accessories, and services shall be warranted by the Winning Bidder. No acceptance will be made if the deliverables' hardware or software have been found to have defects and must be replaced immediately. To ensure that the products will perform as expected, the Winning Bidder shall provide the following:

- a) A 3-year post-warranty service on hardware on **EXISTING** server nodes (7 units) in the cluster system with the following serial numbers: J301XNNV, J301XNNW, J301XNNX, J301XNNY, J301Y6Z4, J301Y6Z5, and J301Y6Z6.
- b) A 3-year hardware warranty on parts, support, and services on the **NEW** server nodes (9 units) including DAS storage to be added to the cluster system.
- c) A 3-year software warranty on updates (bug/security fixes), support, and services on the operating system including the HPC deployment tools and system hardware management software installed on ALL (**EXISTING** and **NEW**) server nodes.
- d) A 1-year standard warranty on desktop workstations (8 units), mobile workstations (5 units), desktop network-attached storage NAS (8 units), and ink tank printers (5 units).

Recognizing the importance of the transitional phase, the hardware warranty period shall commence not upon delivery, but only after commissioning. Replacement parts must be available immediately during the warranty subscription period. Technical support services must be available 24/7 via telephone, text messaging, Internet calls, online chat, and email.