

**Computational and Information Science
Technology Office – Scientific Computing
and Technical Services
(CISTO – SCTS)**

Statement of Work

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1 Introduction

The purpose of this contract is to provide high end computing and data support, as well as general support services, for the NASA Goddard Space Flight (GSFC) Computational and Information Science and Technology Office (CISTO). This Statement of Work (SOW) covers all three CISTO groups and some additional support services for the NASA High End Computing program.

2 Background

The Computational and Information Sciences and Technology Office (CISTO) provides Information Technology (IT) and computational services to support the GSFC Sciences and Exploration Directorate (SED). This includes access to high-performance computing, networking, mass storage, information systems technologies, computational science expertise, real time transmission of satellite data, and support for the NASA High End Computing (HEC) Program.

The Office also engages in a number of educational and outreach programs. CISTO is SED's interface with GSFC's Chief Information Officer and IT organizations in the Information Technology and Communication Directorate (Code 700) regarding IT security policy, implementation, and services; Enterprise Architecture development and compliance; strategic IT investment planning and management; and NASA and GSFC IT policies and initiatives. CISTO also develops strategies to optimize cost-effective use of information technologies.

NASA Center for Climate Simulation (NCCS)

The NCCS (<http://nccs.nasa.gov>) is one of two high-end computing facilities within the NASA High End Computing (HEC) Program (<http://www.hec.nasa.gov>). The NCCS supports high-end computational modeling of Earth science, space science, and exploration. The NCCS is a key resource in the effort to increase understanding of Earth's climate system, natural and human influences on climate and consequences for life on Earth, and to advance space science and scientific exploration beyond Earth. The NCCS currently serves about 600 users. Major projects enabled by the NCCS include GSFC's Global Modeling and Assimilation Office (GMAO) (<http://gmao.gsfc.nasa.gov>) and the Goddard Institute for Space Studies (GISS) (<http://www.giss.nasa.gov>).

The NCCS has been in existence in one form or another since the beginning of the 1970's when the first high performance computers were installed at GSFC. Today, the NCCS is dedicated to providing scientists and engineers with high-end computing and data resources, simulation tools, and analytics specifically designed to carry out critical NASA missions and to make new scientific discoveries. The primary focus of the NCCS is the

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support of climate and data intensive science for the following communities with the following general requirements:

- *NASA Scientific Community*: Simulation data consumers advancing scientific knowledge through large-scale data analysis. These users require direct access to systems with high-end capabilities for effective data analysis.
- *NASA Modeling Community*: Model developers that update, test, validate, and execute climate applications. This community requires the largest amount of computational and storage resources and uses significant amounts of observational data as input into the models.
- *External Scientific Community*: This community exists outside of NASA and uses NASA simulation data for scientific purposes. To date this group typically downloads data via web-based services and performs analysis on data local to the scientist.
- *External Applications Community*: This community has limited Earth science data expertise and has a need to consume both observation and simulation data. This largely under-served community has the potential to increase the demand for climate data needed by communities outside of NASA.

Our understanding of Earth processes is based on the observational data record and is expressed using mathematical models. Climate modelers assimilate the data to combine observational data with model prediction. Climate models produce large data (from hundreds of Terabytes to Petabytes) for the scientific community as well as decision makers. Reanalysis with improved models are regularly run and produce vast amount of data for analysis by the scientific community. In support of data intensive science, the NCCS has designed its computing, storage, networking, and analytics infrastructure with the following characteristics:

- An architecture designed for effective manipulation of large data sets.
- An architecture that makes data sets easily accessible to external users, complemented with analysis and visualization capability.
- A global file system to make data available to all services with highly effective data management tools.
- A “supercomputing” capability with data sets online for efficient data analysis.

Direct Readout Data Systems and Direct Broadcast Algorithm Development

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The Direct Readout Laboratory (DRL) supports the continuous real-time transmission of satellite data to the ground (<http://directreadout.sci.gsfc.nasa.gov>). The users of the feeds of data from the direct readout that have compatible ground receiving equipment and have line-of-sight to the satellite may receive these transmissions. Direct Readout (DR) is the process of acquiring freely transmitted live satellite Direct Broadcast (DB) data. The DRL acquires and pre-processes raw data and generates instrument data products that is sent via DB. The data management technologies, Science Processing Algorithms (SPA) and science processing software tools created by the DRL are used in support of science processing algorithm implementation in real-time data system's direct readout applications, as well as form a foundation from which real-time information technologies are developed in support of exploration systems. All software and tools created by the DRL become public domain software.

High End Computer Networking (HECN)

The HECN Team (<http://science.gsfc.nasa.gov/606.1/HECN.html>) manages the GSFC Science and Engineering Network (SEN) as a non-mission-dedicated high-end computer network at GSFC. The SEN services GSFC projects and users who have computer network performance requirements greater than those baselined for GSFC's general-use campus-wide Center Network Environment (CNE). The HECN team also conducts network R&D and test bed evaluations with advanced network technology. This research contributes to the next generation high-end computer networks at GSFC.

3 General Objectives

The following is a list of objectives designed to meet the mission and vision of CISTO.

1. Provide high-end computing and data systems and services designed to meet the needs of the NASA scientific and engineering communities.
2. Provide a rapid response to changing science and engineering requirements as well as the changing technology needed to best meet those requirements.
3. Evolve the focus from data centric services to knowledge centric services that enable the use of NASA observational and model data in new and innovative ways.
4. Provide a complete set of support services from low-level system administration to high-level application support for the NASA scientific and engineering communities.
5. Sustain a rich and robust operational environment with a high level of operational availability and capability.

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6. Push the envelope of systems and services within CISTO and the NCCS to open new and more efficient methods for modeling, data analytics, collections management, and distribution.
7. Constantly look for the best value solutions for the Government through the use of commodity components, open source software, partnerships, and competitive procurements.
8. Provide mission-specific information and free technologies to acquire and process Direct Broadcast Data; introduce the user community to Direct Readout Systems Technologies; and provide users with a design template to receive, process, and analyze their own Direct Readout Data.

The expected tasks to meet these objectives are described below.

4 Advanced Technology

The contractor shall support the following objectives:

1. Maintain currency with technology through vendor relationships, market research, and the analysis of future technologies for potential use within operational environments.
2. Develop and maintain relationships with other Government agencies with similar capabilities, potential industry partners, and universities in order to broaden the reach, scope, and influence of both CISTO and the NCCS.
3. Obtain the best value solutions through effective and efficient uses of the Government's money by supporting the Government or directly purchasing computing and storage hardware, software, maintenance, or services.
4. Provide rapid response to changing science requirements and the rapid influx of new technology solutions through efficient procurement processes, documentation, solicitation, and integration.

4.1 Advanced Technology and Architecture

The contractor shall be responsible for:

- a. Maintaining currency with high performance computing, storage, networking, and data analytics technologies relevant to current and future requirements. The contractor shall maintain vendor relationships in order to fully understand vendor roadmaps. The contractor shall schedule and host vendor non-disclosure briefings. The contractor shall attend relevant technology meetings and report about hardware and software

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technology trends that may affect the strategic future of CISTO and the NCCS. The contractor shall develop and maintain relationships with other Government agencies and universities with similar capabilities.

- b. Partnering with vendors to provide opportunities for the testing and evaluation of advanced technology hardware and software. The contractor shall provide system administration, networking, security, and user account support for test-bed environments, either on-site or off-site. The contractor shall run benchmarks to compare the performance of new technologies with existing systems and services. The contractor shall author and support the authoring of white papers and presentations to summarize the evaluation of products for potential future use within operational environments.
- c. Providing support for gathering requirements that would enable future computing, storage, and data capabilities and services within CISTO and the NCCS. The contractor shall participate in meetings with existing and potential users to discuss future science and engineering requirements and assist in translating those requirements into computing capabilities and services.
- d. Providing support for development and maintenance of a strategic 5-year architecture for CISTO and NCCS services. The contractor shall review the architecture and provide feedback to the Government based on their understanding of technological trends as well as trends in science and engineering.

4.2 Government Acquisitions, Integration, Delivery Orders

The contractor shall be responsible for:

- a. Maintaining relationships with vendors in order to prepare for upcoming procurements. The contractor shall provide a point of contact so that vendors may inquire about future CISTO and NCCS requirements. The contractor shall schedule and host vendors (either on-site, off-site, or by conference call) as needed for specific discussions about how vendors may provide solutions to meet requirements.
- b. Research and document an analysis of alternatives based on the requirements for procurements. The contractor shall consider “cloud” technology solutions and recommend “cloud” as an option whenever a secure, reliable, and cost-effective solution exists that also meets the requirements. In addition, the contractor shall recommend solutions that align with the NASA Data Center Consolidation efforts and support the adoption of green technology within NASA.
- c. Writing or providing support to the Government in the documentation of specifications for new acquisitions of hardware, software, maintenance, or services.

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The contractor shall support the documentation of all aspects of specification documents, including technical solution, cost, integration, acceptance criteria, and evaluation criteria. The contractor shall provide all acquisition documentation to the Government for review prior to issuing a solicitation.

- d. Competitively acquiring hardware, software, maintenance, services, or supporting materials by issuing the requirements and supporting documentation to relevant vendors. The contractor shall be the purchasing agent of the Government and coordinate all activities of procurement. The contractor shall solicit quotes and/or proposals from vendors to meet the documented requirements. The contractor shall provide a point of contact for vendors to ask clarification questions about procurements and submit quotes or proposals.
- e. Supporting the Government to competitively acquire hardware, software, maintenance, services, or supporting materials for CISTO and the NCCS. As requested, the contractor shall assist in the coordination of all activities related to Government procurements.
- f. Documenting and recommending to the Government the required facility modifications, if necessary, for changes to the operational environment.
- g. Integration services including project planning, coordinating equipment delivery, verifying the accuracy of the bill of materials, installation, and burn-in.
- h. Running new solutions through the required acceptance tests or baseline performance measurements. The contractor shall document and present results for review by the Government prior to acceptance of new equipment or services.
- i. Support for the de-installation, surplus, and removal of equipment from production operations. The contractor shall coordinate, plan, and support the removal of equipment from production operations and coordinate the disposal of the equipment through standard NASA practices, trade-ins, or third-parties, including but not limited to the disposal of electronic media according to NASA regulations.

5 Operations

The contractor shall support the following objectives:

- 1. Maintain a close working partnership between Government, users, and contractor staff for the operation of all systems and services.
- 2. Provide rapid responses to changing user needs, requirements, and technology landscape.

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3. Achieve high levels of service to the end user community and high levels of customer satisfaction.
4. Provide an efficient and effective operational environment that allows scientists to easily and fully use the services provided by CISTO and the NCCS.

5.1 Computing and Network Administration

The contractor shall be responsible for:

- a. Supporting and maintaining high-end computing equipment, high-end computing support equipment, data publication equipment, mass storage equipment, networking equipment, and services within CISTO and the NCCS, including but not limited to, servers, disk subsystems, other storage devices, storage servers, networking, and related hardware, software and infrastructure.
- b. Performing operational system administration duties on IT equipment and software to achieve high levels of availability and functionality, including the installation and testing of software, configuration management, monitoring, metrics gathering and tuning, problem solving and user support.
- c. Providing and maintaining 24x7 automated monitoring of all equipment and services. The contractor shall automatically monitor all critical elements (those impacting user capabilities in real-time) and those elements less critical but whose prolonged outage would impact critical elements and degrade user functionality.
- d. Addressing system issues quickly and promptly. In the event of an unscheduled outage, the contractor shall return the systems to full service as soon as possible. The contractor shall provide a root cause analysis for the system outage and lessons learned that might improve standard operating procedures or future architectural designs and mitigate additional failures. The contractor shall coordinate with relevant vendors, if necessary, to understand the root cause for failures and acquire vendor solutions to prevent or mitigate future failures.
- e. Planning, proposing, and supporting upgrades to the system hardware and software stack as needed. The contractor shall track vendor hardware and software requirements and propose upgrades to the Government as needed to maintain systems in accordance with maintenance contracts or industry best practices.
- f. Supporting the planning, implementation, integration, and acceptance of new systems and services or modifications of existing systems and services for CISTO and the NCCS. The contractor shall support the retirement and de-installation of systems and services for CISTO and the NCCS.

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- g. Addressing user requests and keeping users up to date on progress toward a solution to the user's issue. The contractor shall track their response to the user request through the NCCS ticketing system. The contractor shall provide general trouble shooting for system and low-level hardware and software related issues, coordinate solutions to user problems with vendors if necessary, and track to completion all assigned user problems and issues.
- h. Performing system analysis and performance monitoring in support of user applications. The contractor shall be a part of a closely coordinated team of experts to address specific user application issues.
- i. Supporting capacity planning and metrics gathering. The contractor shall gather and propose metrics to be gathered to track usage for reporting and capacity planning.
- j. Documenting all system related information for computing systems and services. The contractor shall document all Standard Operating Procedures (SOPs), the system design as built and implemented, provide best practices information to users, update web site information, and frequently asked questions. The contractor shall maintain these documents in a shared environment within CISTO and the NCCS.
- k. Working with the Networks and IT Security (606.1) on the Scientific Engineering Network (SEN), Communications and Security Services Division (760) on the Center Network Environment (CNE), and the NASA Integrated Services Network (NISN) in order to maintain high quality network connectivity to NASA and beyond.
- l. Maintaining and operating all systems and services according to FISMA/NIST and NASA IT security guidelines.

5.2 Security

The contractor shall be responsible for:

- a. Developing and maintaining FISMA NIST security plans as required by Federal Law. In addition, the contractor will maintain knowledge of NASA guidance, procedures, and requirements for IT security.
- b. Supporting the IT Security infrastructure including firewalls, security services, time hosts, log hosts, LDAP servers, disk subsystems, other storage devices, networking, and related hardware, software, and infrastructure.
- c. Performing system administration duties on IT Security infrastructure equipment and software. The contractor shall install and test software, provide configuration management of all security systems, monitor, gather metrics, tune, problem solve, and provide user support where appropriate.

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- d. Maintaining and operating all systems and services according to FISMA/NIST and NASA IT security guidelines. The contractor shall maintain the security configuration “checklists” (i.e., configuration guidelines and best practices).

5.3 Facilities

The contractor shall be responsible for:

- a. Coordinating all aspects of CISTO and NCCS related facilities with the appropriate Facility Operations Manager (FOM) and NASA Facility Management Division (FMD).
- b. Providing input into capacity planning to meet facility requirements. The contractor shall support the planning and execution of modifications to the facilities by FMD as required by upgrades or system changes.
- c. Providing a 24x7 monitoring of the operational status of all facilities through automated monitoring (e.g., power, cooling, environmental conditions, leaks) wherever possible. The contractor shall regularly report on the status of all related facilities, coordinate planned outages, and support the root cause analysis of unplanned outages.
- d. Documenting all aspects of the facilities used by CISTO and the NCCS. The contractor shall maintain floor diagrams for all NCCS and CISTO managed spaces, including information about the power requirement for the equipment, cooling loads, capacities, and power distribution.

6 User Support

The contractor shall support the following objectives:

- 1. Maintain highly efficient and effective communications between CISTO, the NCCS, and the user community about all aspects of the systems and services through meetings, forums, brown bags, web sites, and social media.
- 2. Provide a single point of contact to obtain information about CISTO and NCCS services, request access for those services, and rapidly respond to user support requests and questions.
- 3. Build and maintain relationships with the user community to better understand future science requirements and how those requirements might drive CISTO and the NCCS.
- 4. Maintain a complete set of computer science services for the NCCS user community from low-level help desk services through higher level scripting, debugging, porting,

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and application support to the highest-level assistance of optimization and parallelization of applications.

6.1 Help Desk

The contractor shall be responsible for:

- a. Providing a single point of contact for users to obtain information about and request access to all NCCS services. The contractor shall be responsible for communicating to the user community through the use of electronic mail, websites, teleconferences, meetings, and social media (e.g., Twitter, Facebook). The contractor shall provide timely and succinct communications to the user community about system status, availability, system load, downtimes, news, announcements, and relevant changes to the environment that may affect systems and services.
- b. Providing on-site help desk from 8:00 a.m. to 6:00 p.m. Eastern Time (U.S.) Monday through Friday. The contractor shall answer the NCCS help desk phone, take initial emails through the ticketing system, and provide Level 1 support for the users, such as basic trouble shooting, and resolving issues with user accounts.
- c. Providing all aspects of account management, including account creations, account deletions, account modifications, and password resets.
- d. Providing continuous updates to the NCCS website (www.nccs.nasa.gov) about systems and services. The contractor shall create and publish documentation on the website about all aspects of the center such as news and announcements, message of the day, frequently asked questions, lessons learned, best practices, and presentations. The contractor shall provide input for the NASA High-End Computing web site (www.hec.nasa.gov).
- e. Processing all tickets through the NCCS ticketing system by capturing the relevant data about the trouble ticket and performing any necessary Level 1 support. For tickets that require Level 2 support or higher, the contractor shall assign those tickets to designated personnel. The contractor shall track all tickets to completion. The contractor shall look for trends across all trouble tickets, report those trends, and recommend action if necessary.
- f. Reporting on the allocation and accounting of all systems and services used within the NCCS. The contractor shall track and maintain records of the usage of all systems and services by the NCCS community on a daily basis. The contractor shall report on the usage of all systems and services monthly, identify trends, and provide recommendations.

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- g. Coordinating NCCS user forum meetings, brown bags, and weekly user teleconferences with the NCCS user community. The contractor shall be responsible for all aspects of these meetings, including scheduling time and place, announcing the meeting, creating presentations or documents, capturing meeting notes, publishing documents and notes, and providing follow up on action items.

6.2 User Liaisons

The contractor shall be responsible for:

- a. Maintaining liaisons, building relationships, and regularly meeting with key science user communities to ensure that CISTO and NCCS future plans meet their science needs. The contractor shall identify critical performance factors and coordinate with CISTO and the NCCS to ensure that solutions adequately address the computational and storage requirements of the user community. The contractor shall report back to CISTO and NCCS about meetings with users and provide recommendations for how to better serve the user community.
- b. Providing user impact assessments of potential changes to the NCCS operational environment. The contractor shall coordinate changes of the operational environment with the user community.
- c. Supporting all customer outreach activities, including the NCCS user forum meetings, brown bags, and weekly teleconferences. In addition, the contractor shall be a liaison between the NCCS and the broader community by attending other scientific meetings. The contractor shall report back to the NCCS after returning from these meetings and provide recommendations for how to better serve the user community.
- d. Expanding the user base of the NCCS through meeting with potential users. The contractor shall discuss the capabilities of the NCCS with potential users, understand user requirements and workflow, and make recommendations for how the NCCS may be able to assist new science users.

6.3 Applications Support

The contractor shall be responsible for:

- a. Providing Level 2 and above support for the user community. The contractor shall be assigned trouble tickets and requests for assistance through the ticketing system. The contractor shall respond to tickets and work with users, systems administrators, vendors, and the open source community to help resolve any issue.

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- b. Identifying, recommending, and installing programs, utilities, and tools required by the user community (such as different versions of MPI). Once identified, the contractor shall install and test for functionality and performance the proposed programs, utilities, or tools for use on NCCS systems. As appropriate, the contractor shall document the usage of these programs, utilities, or tools and share the documentation with the user community.
- c. Profiling, porting, migrating, debugging, and optimizing applications across different high performance computing systems. The contractor shall respond to requests for support from the user community for general performance engineering of applications, including answering basic to advanced questions, and enhancing and troubleshooting applications across different high performance computing systems.
- d. Benchmarking specific applications, libraries, and tools on different high performance computing systems. The contractor shall baseline the performance of existing systems within CISTO and the NCCS, across NASA, and even outside of NASA as necessary. The contractor shall support the effort to set yearly allocations by running benchmarks for the creation of a standard billing unit. The contractor shall support the running of benchmarks on advanced technology components as necessary and compare the performance of applications to existing systems.
- e. Responding to and supporting requests from the user community to assist in the parallelization of applications on different high performance computing systems. The contractor shall work closely with the user to assess the application through performance profiling, recommend the best approach to parallelization, and implement the agreed upon method for parallelization.
- f. Raising awareness of the services found within CISTO and the NCCS to existing and potential users. The contractor shall provide training and consulting services to users through a variety of mechanisms, including one-on-one support, brown bags, teleconferences, WebEx, on-line documentation, and user forums.
- g. Documenting best practices for how to use CISTO and NCCS resources, relevant white papers, parallelization studies, and general success stories. The contractor shall provide outreach to the CISTO and NCCS user community, universities, and industry partners through the presentation of relevant work at general meetings or conferences.
- h. Monitoring the status and availability of CISTO and NCCS resources from the user perspective. The contractor shall periodically measure the functionality and performance of resources and compare to baseline measurements. The contractor shall maintain documentation of baseline measurements and all subsequent performance measurements. The contractor shall support upgrade and integration efforts as required by testing the functionality and measuring the performance of

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new components. The contractor shall participate in highly collaborative teams, as necessary, to address specific performance issues.

- i. Monitoring the utilization of the systems by analyzing workload characteristics. The contractor shall analyze and recommend changes to the resource management policies and scheduling algorithms to maximize the utilization of resources.

7 Data Services

The contractor shall support the following objectives:

1. Provide services for the NASA science community to continue to evolve from a computation-centric environment to a data-centric environment and knowledge-centric future.
2. Position CISTO and the NCCS within the national scope of climate data development, analysis, and production.
3. Provide services to the science community for advanced data publications, analysis, and management.
4. Enhance the availability of data to traditional and non-traditional users and facilitate the use of data in new and novel ways.
5. Broaden the scope of CISTO and NCCS to support Earth observational and reanalysis data development, analysis, and production.

7.1 Publication and Distribution

The contractor shall be responsible for:

- a. Maintaining relationships and understanding of key science user requirements to ensure that NCCS and CISTO plans reflect the science needs of the user community with respect to data publication and distribution. The contractor shall evaluate and test potential data publication and distribution software and services for use by the NCCS user community.
- b. Supporting and maintaining services that enable data publication through NCCS and CISTO web based services and distribution to community publication systems such as the Earth Systems Grid (ESG) and NASA's Distributed Active Archive Centers (DAACs). The contractor shall install and assist in the operation of data publication software and services for use by the user community. The contractor shall monitor and document availability and usage of these services.

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- c. Assisting users in making use and taking advantage of the data publication services. The contractor shall work with users to register and publish data through the data publication services. The contractor shall create and share documentation of how to use the data publication services for the users. The contractor shall resolve support and trouble tickets associated with the data publication services.
- d. Facilitating communication and interaction with other NASA programs and centers, Government agencies, high performance computing centers, and universities working on software and services to share technical ideas and potential solutions centered on data publication and distribution.

7.2 Analysis and Visualization

The contractor shall be responsible for:

- a. Maintaining relationships and understanding of key science user requirements to ensure that the NCCS and CISTO plans reflect the science needs of the user community with respect to data analysis and visualization services, with emphasis on the analysis of large, complex data sets. The contractor shall evaluate and test potential data analysis and visualization software and services for use by the user community.
- b. Supporting and maintaining services for the user community to perform analysis and visualization of large, complex data sets. The contractor shall install and operate the data analysis and visualization hardware, software, and services for use by the user community. The contractor shall monitor and document the availability and usage of these services.
- c. Supporting users to move and transform data into the appropriate format for the data analysis service. The contractor shall create and share documentation for users as to how to use the data analysis services. The contractor shall resolve support and trouble tickets associated with the data analysis and visualization services.
- d. Developing new methods for data analysis and visualization for use by the user community. The contractor shall work with existing off the shelf or open source tools and adopt them in innovative ways for use by the users.
- e. Facilitating communication and interaction with other NASA programs and centers, Government agencies, high performance computing centers, and universities working on software and services to share technical ideas and potential solutions centered on data analysis and visualization.

7.3 Collections Management

The contractor shall be responsible for:

- a. Applied research and development aimed at large-scale scientific data collections management and high-performance data analytics. The contractor shall provide full system development life-cycle capabilities that can move advanced climate data services technologies from concept to production.
- b. Data stewardship aimed at large-scale scientific data curation; knowledge management; provenance management; data and metadata interoperability; integration of heterogeneous collections of climate simulation, observational, and other types of data; data and information standards; and scientific data collections policy, procedure and workflow.
- c. Education, outreach, and technology transfer aimed at disseminating the knowledge, experience, and technologies resulting from work in climate data services.
- d. Project management aimed at coordinating all technical and non-technical climate data services activities.
- e. Technical services aimed at providing software, hardware, networking, and general systems administrative support for climate data services activities.
- f. Operational services aimed at providing support for the production deployment of climate data services capabilities. The contractor shall provide operational support of the NCCS Data Management System (DMS), the development and implementation of policies, procedures, and workflows for DMS-managed data collections, rapid provisioning of new customer solutions using DMS technologies, and responsive end-user support for DMS customers.

7.4 Opportunity Development

The contractor shall be responsible for:

- a. Opportunity development aimed at identifying and building relationships with new customers and applications that have a need for climate data products and technologies and can otherwise benefit from climate data services.
- b. Partnership development aimed at building collaborative relationships with Government agencies, universities, freestanding research organizations, industry, and other private-sector entities that can advance the climate data services mission of CISTO and the NCCS.

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- c. Applied research and development focused on new uses of climate data within and beyond the traditional climate research community, including the Geospatial Information Services (GIS), remote sensing, and applications communities. The contractor shall build services to enable the tailored use of NASA data by these outside communities in ways that are not currently being supported.

8 Program Support

The contractor shall be responsible for:

- a. Providing services to support stewardship, management, and documentation of CISTO assets. The contractor shall be responsible for all aspects of tracking property, including maintaining inventories, updated the NASA property database, receiving, excessing, and trading-in equipment. The contractor shall be responsible for supporting property audits, as necessary, tracking the lifecycle of capital assets, and coordinating all deliveries and pickups.
- b. Coordinating, ordering, tracking, cost analysis and providing a single point of contact between CISTO and NASA managed services (e.g., ACES) for such things as personal computing hardware, software, and mobile platforms.
- c. Providing a single point of contact for CISTO to coordinate and support office moves, including logistics, furniture, and telephones.
- d. Coordinating with the NASCOM Communications group to add, disconnect, move, or change telephone services, provide or change phone mail services, and other NASCOM services.
- e. Providing administration support for the CISTO office. The contractor shall be responsible for all aspects of office support, including answering phones, managing calendars for CISTO managers, coordinating meetings, ordering office supplies, maintaining documentation, files and office records, producing and distributing deliverable reports, support for civil service travel, and general communications to all of CISTO.
- f. Providing resource analysis support for the CISTO office. The contractor shall support the creation of necessary documentation for NASA purchase orders. The contractor shall submit, track, maintain records, and provide a point of contact between CISTO and the NASA procurement office for NASA purchase orders.

9 High End Computing Network (HECN)

The contractor shall be responsible for:

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- a. Supporting and operating the existing Science and Engineering Network (SEN) resources, including monitoring, statistics, reports, performance, troubleshooting, taking tickets, and resolving problems. The contractor shall maintain the system design as built and all other related documentation for the SEN system and operations. The contractor shall provide security operations, planning, and documentation for the SEN.
- b. Architecting, designing, and implementing upgrades to the SEN. The contractor shall expand the SEN to other groups within GSFC by meeting with potential customers, understanding requirements, and proposing solutions to meet those requirements.
- c. Investigations of advanced technology, working with vendors to evaluate products, write white papers, and perform demonstrations for technology designed for high performance networking. The contractor shall test network performance between network end points that may have significant impact on NASA's mission.
- d. Coordinating across GSFC with other science groups that need high performance networking capabilities. The contractor shall also coordinate with communities outside of NASA, including universities, national laboratories, and industry partners. The contractor shall maintain the high performance networking interfaces to networks outside of NASA.
- e. Providing general networking support for Code 606. The contractor shall interface with the GSFC/NASA provided networking services. The contractor shall maintain the high performance networking interfaces to networks outside of NASA.

10 NASA High End Computing Program Office Support

The contractor shall be responsible for:

- a. Providing the coordination for the allocation of NASA HEC Program resources on behalf of the Science Mission Directorate. The contractor shall coordinate all aspects of allocation requests including issuing periodic calls for allocation awards and adjustments, assisting users in their requests, reviewing users submissions, supporting deliberations of NASA Headquarter allocation panels, and documenting panel decisions for approval.
- b. Supporting the end users by conveying the approved allocations to both the users and the NASA computer facilities. The contractor shall monitor usage, recommend allocation adjustments monthly, and support the closing of accounts.
- c. Guiding the development of the on-line allocation request tools to improve its usability to the end users and to enhance the quality and access to the data

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gathered. The contractor shall support the usage of the on-line allocation tools as a resource for other Mission Directorates.

- d. Preparing the HEC Program monthly report, which includes the analysis of the usage of the program's primary resources (compute, storage, network, and general support). The contractor shall develop regular reports spanning the program that depict the levels of service being provided and emerging trends.
- e. Ensuring access to the analysis data through on-line business intelligence tools. The contractor shall assist in tailoring the tool and reports to provide stakeholders with the appropriate reporting.
- f. Documenting and reporting the scientific and technical accomplishments of NASA HEC Program.
- g. Preparing and supporting the preparation of reports and articles on the scientific and technical accomplishments across the HEC Program. The contractor shall work with NASA to produce and support the production of posters, videos, interviews, news releases, social media, and other forms of outreach highlighting HEC Program accomplishments.
- h. Maintaining and enhancing the content of the HEC Program website and other related HEC Program websites.
- i. Promoting the HEC Program activities at NASA-sponsored exhibits at conferences and other events. The contractor shall prepare promotional materials, such as brochures, posters, and displays, for conferences.
- j. Maintaining currency with technology advances through conference attendance, journals, newspapers, Internet, and subject matter experts.

11 Direct Readout Data Systems and Direct Broadcast Algorithm Development

Direct Broadcast (DB) is the continuous real-time transmission of satellite data to the ground. Users having compatible ground receiving equipment and have line-of-sight to the satellite may receive these transmissions. Direct Readout (DR) is the process of acquiring freely transmitted live satellite DB data. This statement of work reflects all the development that is necessary to acquire, pre-process raw data and generate instrument data products that is sent via DB. The data management technologies, SPAs and science processing software tools delivered as a result of this effort will be used in support of science processing algorithm implementation in real-time data system's direct readout applications, as well as form a foundation from which real-time information technologies

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are developed in support of exploration systems. All resulting deliverables will become public domain software.

The contractor shall be responsible for:

- a. Enhancing database schemas, processes and software procedures and agents used to create an open source direct readout data system technology foundation for a distributed data environment and modular real-time data systems architecture for science data processing algorithms (SPAs).
- b. Creating self-extracting and self-installing SPAs within a science data processing architecture.
- c. Creation and implementation of automated metadata extraction tools from PDS, RDR and EDR files resulting in more information about a product and its heritage.
- d. Creation and insertion of data handling agents which would allow for the reduction or elimination of memory leakage, run-away files and halted processes in real-time and direct readout processing systems, where S/C data is being processed at the same time it is being received by the front-end acquisition sub-system.
- e. Providing updates and new direct readout Science Processing Algorithms (SPAs), enhancements to direct readout database schemas, and science processing and visualization software tools.
- f. Promoting synergy between NASA, the community and interdependent direct broadcast data users.
- g. Maintaining NASA GSFC's Direct Readout ground stations requiring periodic RF performance evaluation, tracking monitoring and calibration. Exercise troubleshooting and repairs as well as coordination with vendor if extensive repairs are necessary.
- h. Evaluating and upgrading hardware and software to be in compliance with new Direct Broadcast.

12 Standards

12.1 NASA Directives

The contractor shall compile with the following NASA Directives:

- a. NASA Policy Directive (NPD) 2190.1 "NASA Export Control Program"

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- b. NASA Procedural Requirements (NPR) 2190.1B “NASA Export Control Program”
- c. NPR 2210.1C “Release of NASA Software”

12.2 Electronic and Information Technology Accessibility Standards

In order to comply with the Section 508 Electronic and Information Technology Accessibility Standards, the contractor shall perform all work required under this contract in compliance with the following technical standards delineated in Code of Federal Regulations (CFR) Title 36:

- a. Subpart B – Technical Standards
 - a. §1194.21 Software applications and operating systems.
 - b. §1194.22 Web-based intranet and internet information and applications.
 - c. §1194.23 Telecommunications products.
 - d. §1194.24 Video and multimedia products.
 - e. §1194.25 Self contained, closed products.
 - f. §1194.26 Desktop and portable computers.
- b. Subpart C – Functional Performance Criteria
 - a. §1194.31 Functional performance criteria.
- c. Subpart D – Information, Documentation, and Support
 - a. §1194.41 Information, documentation, and support.

12.3 Emergency Preparedness and Response

In the event of an unusual or emergency situation, the contractor shall support NASA, within the general scope of work, but in currently unidentified ways, in preparation for or in response to emergencies. The contractor shall support NASA only when one or more of the criteria in the FAR 18.001 are met, enabling NASA to utilize “Emergency Acquisition Flexibilities.” In the event that emergency preparedness and response requirements result in changes to the contract, the contractor shall process all contract adjustments in accordance with the Changes clause of this contract.

13 Transition Support

The contractor shall be responsible for:

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- a. Fully supporting the transition of all tasks to any subsequent contractor or service provider that the Government selects. The contractor shall promptly provide the necessary up-to-date documentation to the post-transition service provider, such as standard operating procedures, and system design documentation.
- b. Supporting the continuous operations of CISTO and the NCCS by providing access to personnel, facilities, systems, services, and data. The contractor shall ensure all equipment has been transitioned to the Government and that all third party service contracts will be maintained throughout the transition.