

(Instructions and Distribution on Reverse)

1. CONTRACTOR:
SSAI

2. CONTRACT NO.:
NNG12HP06C

3. TASK/REVISION NO.:
CY4 0 16

4. JOB ORDER NO./PROJECT:

5. FLIGHT HARDWARE/SOFTWARE;
CRITICAL GSA (IF, YES, OBTAIN
BLOCK 16 CONCURRENCE):
YES NO

6. DESIGNATED FLIGHT
ASSURANCE MGR.:

7. DESCRIPTION OF WORK TO BE PERFORMED (OBJECTIVES OR RESULTS DESIRED):

GMAO GEOS Software Infrastructure Team

8. TASK DOCUMENTATION REQUIREMENTS/DELIVERABLE ITEMS:

See Attached

9. PERFORMANCE/MILESTONE SCHEDULE:

February 1, 2015 – January 31, 2016

10. QUALITY ASSURANCE REQUIREMENTS:

11. TRAVEL, MATERIALS, ETC., KNOWN TO BE REQUIRED:

12. OTHER (FUNDING, NTE, HOURS, ETC.):

Estimated Cost
Fixed Fee
Estimated Total Cost-Plus-Fixed Fee \$ 635,063

13. TASK ORIGINATOR/MONITOR/CODE/PHONE:

Arlindo Dasilva

14. BRANCH APPROVAL:

15. DIVISION CONCURRENCE:

16. CONTRACTING OFFICER'S TECHNICAL REPRESENTATIVE:

Stephen Cohn

17. CONTRACTOR SIGNATURE:

18. THIS TASK ORDER IS ISSUED
PURSUANT TO THE TERMS OF THE
CONTRACT.

Ayana A. Briscoe
CONTRACTING OFFICER'S
SIGNATURE/ DATE Ayana A. Briscoe

Contracting Officer
TYPED OR PRINTED NAME

Science Systems and Applications, Inc.
NNG12HP06C
Task Order Statement of Work

Task Order Number: CY4_16 Mod0

Task Order Title: GMAO GEOS Software Infrastructure Team

1.0 Task Monitor (TM):

Name: Arlindo DaSilva
Organization: GMAO:GMAO
Email Address: arlindo.m.dasilva@nasa.gov

2.0 Description of Work to be Performed

MOD 1 CHANGES ONLY THE TM FOR THIS TASK, FROM MICHELE RIENECKER TO ARLINDO DA SILVA. THERE ARE NO OTHER CHANGES FROM MOD 0.

No significant changes from Mod 1 CY 2 to Mod 0 CY 3.

Change from CY3 to CY4: addition of element (6) to subtask a. Text above is retained for the sake of change tracking.

This task is to provide software engineering support to the Global Modeling and Assimilation Office. The contractor will support the software engineering and High End Computing (HEC) aspects of the maintenance and development of the GMAO's GEOS Earth System Model and its associated Data Assimilation System (DAS), and their application to weather and climate prediction, and various scientific studies. The work will include support of the software frameworks needed for the development and integration of individual model components, such as the GEOS Atmospheric General Circulation Model (AGCM) and the Catchment Land Surface Model (LSM) and the DAS associated with each of GMAO's Earth System components; and the integration of externally developed components, such as the ocean, atmospheric chemistry, and sea- and land-ice models, into the GEOS modeling and data assimilation systems. Support will include optimization of code performance, preparation and conduct of regression test suites to test codes on new compilers or computer systems

Subtask a: GEOS Model and Data Assimilation Systems - Infrastructure Development, Maintenance and Documentation

The contractor shall:

- (1) Develop technical software infrastructure that would enable CM best practices for the entire modeling and DAS environment, to include input files (boundary condition data, observations, etc.), pre- and post-processing utilities, as well as the model and assimilation software and build and run scripts.

- (2) Maintain source control for the entire GEOS modeling and DAS environment in the existing CVS repositories and the support the transition to newer source control systems as required by the TM.
- (3) Support the development of the ESMF-based common modeling infrastructure used in the GEOS modeling and assimilation systems, especially through continued development of the MAPL toolkit, as directed by the Lead Scientist for Modeling.
- (4) Support software maintenance activities such as routine regression testing and third party software library upgrades.
- (5) Perform the GMAO-specified testing, validation, and documentation procedures of all model and DAS tags released internally or externally.
- (6) In close collaboration with the GEOS-5 model gatekeeper, perform technical GEOS-5 model software integration activities in support of the GEO-5 modeling group. This activity involves incorporating the latest development by science developers into the latest UNSTABLE tag, verifying that the new system passes regression tests, and zero-diff tests when appropriate. Final integration and issuing of non-unstable tags is still to be performed by the GEOS-5 model gatekeeper, not the SI Team staff.

Subtask b: Model and Assimilation Systems Development

The contractor shall:

- (1) Support the implementation of the MAPL/ESMF-based common modeling infrastructure in new components and upgrades of existing components of the GEOS modeling and assimilation systems, assisting in their use by other members of the GMAO and by outside collaborators as directed by the Lead Scientist for Modeling.
- (2) Prepare and maintain Developer's and User's Guides for MAPL and guides on software best practices and other topics identified by the Software Infrastructure Team.
- (3) Provide guidance to code maintainers on the preparation and conduct of routing regression tests for components in the GEOS software suite.
- (4) Give at least one tutorial a year to GMAO code developers on MAPL, software best practices, regression testing, and other appropriate topics identified by the Software Infrastructure Team and/or the TM.

Subtask c: Performance Engineering of GEOS systems in High Performance Computing Environments.

The contractor shall:

- (1) Support optimization of code performance by the conduct of timing tests and use of performance tools available on the HEC system.
- (2) Port appropriate GEOS modules to GPUs or MICs, as specified by the GMAO Lead Scientists for Modeling and Assimilation.
- (3) Prepare and conduct regression suites to test codes on new compilers or computer systems.

Subtask d: Interface with NASA Supercomputing Centers

The contractor shall:

- (1) Provide information on upcoming NCCS and NAS system modifications and enhancements to the GMAO user community and coordinate GMAO user feedback to NCCS and NAS as required at their weekly user telecons.
- (2) Provide benchmark codes to NCCS and NAS, and support the benchmark implementation, as requested by the TM.

Support the GMAO's High Performance Computing Lead, identified by the GMAO Chief, by providing information on specialized HEC requirements as requested.

3.0 Special Requirements

None

4.0 Performance/Milestone Schedule

The GMAO Contract Year 4 POP is February 01, 2015 - January 31, 2016

5.0 Deliverables/Reporting Requirements

All subtasks will provide software/algorithm documents and user guides in conformance with GMAO guidelines as appropriate. Monthly progress reports will be provided. The following deliverable schedule has been identified for the activities in this task.

Subtask a: GEOS Model and Data Assimilation Systems - Infrastructure Development, Maintenance and Documentation

- Document the infrastructure on the GMAO intranet and as specified by the TM.
- Conduct regression test suites for each new model tag for each compiler update, within one week of the availability of the new compiler update.

Subtask b: Model Development

- Document new ESMF/MAPL compliant interfaces and components within 1 month of completion of new developments.
- Develop an online tutorial as a guide to GMAO's use of ESMF and MAPL. Update as needed.

Subtask c: Performance Engineering of GEOS systems in High Performance Computing Environments.

- Conduct timing tests and use HEC performance tools to evaluate model performance with each new model tag, compiler, or hardware change within 5 working days of the change.

- Conduct regression test suites on new platforms made available through the NCCS or NAS within two weeks of their availability.
- Conduct tests to ensure that software implemented for GPUs provide zero-difference in the results on standard processors.

Subtask d: Interface with NASA Supercomputing Centers

- The contractor shall participate in weekly NCCS and NAS user telecons, representing GMAO special needs and identifying issues relevant to GMAO that arise during the telecons. A summary of issues will be presented to the TM weekly and communicated via email to GMAO users as appropriate.
- The contractor shall assemble a benchmark suite within 2 weeks of a request.

6.0 Other Information Needed for Performance of Task

Travel Authorized: Travel is anticipated to attend software training, ESMF workshops, and/or HEC workshops, up to four domestic trips to be approved by the TM.

7.0 Data Rights

N/A

8.0 Safety

Staff on this task will comply with federal, state, local, and center safety regulations. This will be accomplished through management emphasis, technical training, and personal responsibility. Staff will participate in safety orientation and training in accordance with the contract Safety and Health Plan, and work within the requirements of that plan.

9.0 Risk

Contractor shall provide ongoing risk assessment and mitigation in performance of the Task Order. Priorities shall be re-evaluated as appropriate with the TM. Cost and schedule performance shall be assessed on a regular basis (no less frequently than monthly) and significant variations discussed and acted on in consultation with the TM and COTR.

10.0 Proposed Cost and Fixed Fee

In accordance with Paragraph B.5, of the contract, propose the Cost and Fixed Fee amount.