

# **Multimodal Data Analytics Work Statement**

## **1. Background**

The XXX Multimodal Information Group supports research in analytics and evaluations from multimodal datasets by engaging with a community of stakeholders to define develop and advance the state of art in data analytics for multimodal dataset access including video analysis, speech, and image recognition technologies.

<AGENCY> designs experimental test protocols, provides guidance to help ensure that test data is collected as appropriate for addressing identified challenges, develops metrics and implements community evaluation that focus research on specific problems preventing the technology from reaching its full potential. This position will perform tasks the Multimodal Information Group requires to fulfill their mission of research and evaluations to design and formulate techniques to conduct evaluations across multimodal data types.

## **2. Scope**

The general scope of this task order falls under the NITAAC CIO-SP3 Small Business Task Areas: 5 IT Operations and Maintenance; 6 Integration Services, and 10 Software Development. Research areas include:

- Software maintenance and upgrades
- Network/Hardware Support
- Installation, Configuration, and Tuning
- Data Quality management
- IT Infrastructure Optimization
- Infrastructure Engineering, Development, Coding and Testing
- Test and Evaluation
- System Engineering
- Architecture Validation and Verification
- Requirements Analysis, Design, Coding and Testing
- Application Prototyping
- Program Evaluation Software
- Database Development and Management
- Software Development

- Signal Processing
- Data Set Generation – Design and Development

### **3. Purpose and Objectives**

The purpose and objective for this task order is to extend existing research and development for the evaluation of multimodal data analysis technology in the research domain, at <AGENCY>. The purpose of this procurement is to perform tasks in infrastructure design for multimodal data analysis, database design and development, data structures, indexing, software architecture, software engineering and data analysis to achieve the following <AGENCY> objectives:

- Architect, design and develop infrastructure to be used for evaluations of analytics technologies.
- Architect, design and develop databases to be used for evaluations of analytics technologies.
- Design new data structures and indexing mechanisms to access heterogeneous data that could be housed in distributed locations.
- Compile families of software stacks used for multimodal data processing and analytics.
- Design and develop SQL-relational database and NoSQL data access solutions.
- Research and consider integration of evolving analytics software stack solutions as potential alternatives to existing commonly used stacks.
- Integrate algorithms and tools to accommodate processing of small and massive data sets of structured and unstructured compositions to support research activities in <AGENCY> managed technology evaluations.
- Design APIs for analytics systems to support language bindings from analytic solutions written in a diverse languages.

### **4. Contract Type**

The contract type is Firm-Fixed-Price (FFP).

### **5. Place of Performance**

The work shall be performed at <AGENCY>.

### **6. Period of Performance**

The period of performance for this effort is XXX.

## 7. Specific Tasks

The following are the specific tasks to be performed by the Contractor.

Tasks 1, 2 and 3 are to be performed during the base period of this contract. Tasks 4, 5, 6 and 7 are optional tasks that are to be performed if the Option Period 1 of this contract is exercised.

### A. Base Period

The Contractor shall perform the following:

1. **Task 1** – Architect, design and develop software infrastructure stack to be used for evaluations of analytics technologies. The Contractor shall perform the following:
  - Research, and document existing software stacks for use in <AGENCY> evaluations of analytics solutions.
  - Install, integrate and test software stacks for data analysis and multimodal processing.
  - Implement upgrades to stacks as new versions become available, for use in <AGENCY> data analysis and multimodal processing evaluations.
2. **Task 2** – Architect, design and develop databases to be used for evaluations of analytics technologies that are developed by various stakeholders (within and outside <AGENCY>). The Contractor shall perform the following:
  - Design, implement, and test novel database architecture designs to accommodate the multimodal data types used in <AGENCY> managed technology evaluations.
  - Design for Data quality, integrity, and management of complex datasets.
  - Administer and monitor database and address data security solutions as applicable.
  - Design and develop efficient techniques for fast, optimized data access and transfer.
  - Design of distributed or networked database systems.
3. **Task 3** – Architect, design and develop new data structures and indexing mechanisms to access heterogeneous data. The Contractor shall perform the following:
  - Design, implement, and test novel data structures to enable access to and processing of the multimodal data types used in <AGENCY> managed technology evaluations.

- Design, implement, and test new data indexing mechanisms to allow access to and processing of the data types used in <AGENCY> managed technology evaluations.

## **B. Option Period I (If Exercised)**

The Contractor shall perform the following:

1. **Task 4** – Architect, design and develop new data query and retrieval mechanisms to access data. The Contractor shall perform the following:
  - Design, implement, and test novel data search, query and retrieval solutions to enable access to and retrieval of the data types used in <AGENCY> managed technology evaluations.
  - Research, design, implement and test SQL and nSQL mechanisms to allow access to data across different scales.
2. **Task 5** – Integrate algorithms and tools to accommodate processing of small and massive data sets of structured and unstructured compositions to support various research activities in <AGENCY> managed technology evaluations. The Contractor shall perform the following:
  - Design, implement, and test frameworks to Integrate algorithms and tools to accommodate analytics on multimodal structured and unstructured data sets.
  - APIs for data access, query and retrieval.
  - Design, implement, and test tools to support multi-language bindings and/or interoperability for analytics systems.
  - Integrate algorithms and tools to accommodate processing of small and massive data sets of structured and unstructured compositions to support research activities in <AGENCY> managed technology evaluations.
3. **Task 6** – Architect, design and develop software infrastructure stack to be used for evaluations of analytics technologies. The Contractor shall perform the following:
  - Implement upgrades to stacks as new versions become available, for use in <AGENCY> data analysis and multimodal processing evaluations.
4. **Task 7** – Architect, design and develop updates to databases and indexing mechanisms to be used for evaluations of analytics technologies that are developed by various stakeholders (within and outside <AGENCY>). The Contractor shall perform the following:

- Design, implement, and test updated database architecture designs to accommodate the multimodal data types used in <AGENCY> managed technology evaluations.
- Design for Data quality, integrity, and management of complex datasets
- Design and implement updates for efficient techniques for fast, optimized data access and transfer.
- Design, implement, and test updated data indexing mechanisms to allow access to and processing of the data types used in <AGENCY> managed technology evaluations.

## **8. Technical Requirements**

The Contractor shall provide a key technical member whose abilities meet a very specialized and unique combination of technical capabilities. The Contractor's key personnel shall satisfy the following technical requirements.

- Master of Science or more advanced degree in Computer Science with emphasis on databases, data architectures, and data structures, algorithms, statistics or equivalent.
- Experience as a senior database architect with over 10 years of experience.
- Expertise and over 10 years of experience in database architecture design and development.
- Expertise and over 10 years of experience in system architecture design, development and implementation.
- Expertise and over 10 years of experience in data structures, indexing, query, and retrieval.
- High level of proficiency in procedural, object-oriented, and scripted programming languages such as Java, C, C++, Perl and Python.
- Experience in cross platform development for multiple variants of Unix, Linux including 32 and 64 bit.
- Experience with NoSQL and SQL databases.
- Familiarity with statistics.
- Familiarity with algorithms.
- Experience with XXX, XXX, XXX, and related software stacks.
- Strong oral and written communication skills.

## **9. Other Pertinent Information or Special Considerations**

- Excellent data management skills including ensuring data integrity, data access, security, and archiving procedures.
- Sufficient knowledge of the language technology and video extraction research domains to be able to converse fluently with the research communities to transform research requirements into concrete formalisms.
- US Citizenship is strongly preferred but not required.

## **10. Key Personnel**

- a. Contractor personnel shall be identified by name and title/job classification with accompanying CV/resume in offeror proposals as key personnel.
- b. The Contractor agrees that the above key personnel shall not be removed from the contract effort, replaced, or added to the contract without a compelling reason and without compliance with paragraphs (3) and (4) hereof. The Government will not approve substitutions for the sole convenience of the Contractor.
- c. If any change to the key personnel position becomes necessary (substitutions or additions), the Contractor shall immediately notify the Contracting Officer in writing, accompanied by the resume of the proposed replacement personnel who shall be of at least substantially equal ability and qualifications as the individuals currently approved for that category.
- d. All requests for approval of changes hereunder must be in writing, via email, and provide a detailed explanation of circumstances necessitating the proposed change. Request for changes should be made whenever the need is identified. Beside the resume, the request must also provide:
  - A comparison of skills and qualifications to those set forth in the accepted resume proposed for substitution.
  - A signed employee procurement integrity agreement.
  - Number of hours the Contractor will provide at his/her own expense to train the proposed replacement.
  - Any other information requested by the Contracting Officer to reach a decision.

## **11. Deliverables/Delivery Schedule**

- a. Monthly Status and Progress Summary Reports – The Contractor shall prepare and submit Monthly Status and Progress Summary Reports. Reports can be in either email body or MS Word format and shall be forwarded to the COTR by the 10th calendar day of the month following the reporting period. In addition, this Report shall be presented in person to <AGENCY> project manager or other

COTR designees. The Monthly Report shall be a compilation of management issues and meetings and work done during the month reported and in sufficient detail to ensure understanding of any issues and performance progress. The format and content of the delivered Reports shall include the following:

- Work and deliverables completed during the reporting period.
  - Status of on-going activities.
  - Summary of tasks performed under Section 7 (Specific Tasks) of the Statement of Work.
  - Problems or issues identified.
  - Alternatives and/or recommended solution(s) for identified or projected problems or issues.
- b. Mid-year and Final Reports – The Contractor shall provide mid-year and final reports in MS Word and/or Excel format(s) to the COTR at the six-months and conclusion respectively of the period of performance. These reports shall summarize objectives achieved and, if any, significant issues, problems, and recommendations to improve the process in the future. The mid-year and final reports shall also include the deliverables listed in the Deliverables table below.

**Table 1 – Deliverables for Mid-Year and Final Report**

<b>SOW Task #</b>	<b>Deliverable</b>	<b>Deliverable Due Date</b>
1.	Research existing software stacks. Operational software stacks designed and integrated for data analysis and multimodal processing utilizing the <AGENCY> Analytic Test-Bench	Documentation of existing software stacks due 1-month after award. Documentation of testing methods and demonstrative use cases of software stacks due in the final report.
2.	Database (DB) architecture completed for: 1. Structured data access 2. Unstructured data indexing and access 3. Data set portioning Designs of data access and extendible DB systems completed.	Documentation of (1) DB architecture and (2) demonstrative use cases for data access and indexing due in final report. Documentation of Task 2 designs due in the mid period performance report.
3.	Data structures and indexing mechanism completed for heterogeneous data access.	Data structures definitions and demonstrative use case for multimodal data access due in final report. Indexing mechanism documentation due in final report.
4.	Novel query and retrieval mechanisms completed for heterogeneous data access.	(Option Period 1) Due four-months from contract award.
5.	Software design and development completed for test frameworks integrating algorithms and tools for analytics on multimodal multi-structured data sets.	(Option Period 1) Documentation in the form of a user manual due in final report.
6.	Minimally one update to the operational software stacks integrated for data analysis and multimodal processing utilizing the <AGENCY> Analytic Test-Bench	(Option Period 1) Documentation of update due in final report.
7.	Minimally one update in database (DB) architecture completed for: 1. Structured data access, or 2. Unstructured data indexing and access, or 3. Data set portioning	(Option Period 1) Documentation of update due in final report.
8.	Monthly Reports (can be in email body or MS Word format)	By 10 <sup>th</sup> day monthly



## **12. Quality Assurance Surveillance Plan (QASP) – Post-Award Administration**

The following will be used for evaluation of Contractor work quality and progress.

### **A. Objective**

The purpose of the Quality Assurance Plan is to provide quality-monitoring procedures to assure that the Contractor is meeting the requirements in a reasonable period of time and of acceptable quality. The Quality Assurance Plan shall help ensure the COTR has a method for detecting and remedying any performance deficiencies early on.

### **B. Performance Standards**

1. **Quality Level:** The Contractor shall be monitored in weekly or bi-weekly meetings to determine if the requirements are being met. The Contractor is to document bug reports/fixes and plan changes as determined in meetings with <AGENCY> staff in a monthly progress report to the COTR.
2. **Frequency:** The COTR or their designees shall adjust the frequency of meetings with the Contractor based on determination of work progress and the need for planning review.
3. **Management Responsiveness:** The COTR or their designees shall determine whether the Contractor has managed the task order effectively and efficiently with successful and timely compilation of software and applications development requirements as set forth in the Performance Work Statement. The COTR shall confirm whether the Contractor has satisfactorily met all reporting requirements.

### **C. Evaluation Methods**

The COTR shall conduct performance evaluations based upon Section II above and the required performance levels set forth in the order. The following techniques shall be used to perform evaluation:

1. **Materials Review:** The COTR and/or designees shall review the materials generated by the Contractor including progress reports and any of the following: software documentation, technical reports software comments, software source code, executable applications, technical presentations, technical papers Web pages, data compilations, memoranda and other documents intended for publication.
2. **Performance Tests:** The COTR and/or designees shall consult with users of the software and data compilations generated by the Contractor both within and outside <AGENCY> to determine if it is meeting the documented functionality and is of acceptable quality.
3. **Function Tests:** <AGENCY> users associated with the project work tasks shall implement functional tests of the software and data compilations generated by the Contractor and report the results to the COTR or designees.

### **13. Risk Assessment**

The information technology security risk for service contract personnel is XXX.

### **14. Security**

On-site Contractor personnel shall read and adhere to all <AGENCY> Information Technology Security policies and procedures that will be provided <AGENCY> within 24 hours of receiving access to the <AGENCY> Intranet. Contractor personnel shall also complete the <AGENCY> IT Security Awareness Training and Safety training. The <AGENCY> Office of Information Systems Management (OISM) and <AGENCY> Office of Safety shall provide the training.

### **15. Government Furnished Equipment (GFE)/ Government Furnished Information (GFI)**

Office space will be provided at the <AGENCY> campus including desk, telephone with <AGENCY> extension, computing equipment and freely available software for the Contractor to use in performing his/her work.

### **16. Transition Plan**

The Contractor shall deliver a Transition Plan within 30 days of contract award. If applicable, discuss how the work would be transitioned to a different Contractor or contract vehicle. Example content could include transition schedule; training of new staff; handover of documents, user guides, and other relevant material; security issues (return of badges, tokens, and closing of computer accounts).