Request For Proposal

Software Development
For
Semantic SOA

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SOFTWARE DEVELOPMENT FOR
SEMANTIC SOA
REQUEST FOR PROPOSAL (RFP)

1. Introduction

Presently, CAIR is involved in the development of a range of technologies for Emergent Warfare. The Artificial Intelligence and Neural Networks (AINN) group has successfully completed and established several Decision Support Systems (DSS) for the case of mobilization of a Formation of the Indian Army.

Under this development contract, it is required that the existing application software, developed in CAIR, be taken for extension and enhancement as per additionally perceived user requirements. This software development will be carried out as per the Terms and Conditions spelt out in subsequent paragraphs.

A Techno-Commercial software development proposal is invited through this RFP. For facilitating the development process, the system requirements have been detailed in the subsequent paragraphs. It is essential that the Development Partner (DP) give the quotation for the defined tasks by addressing each and every point indicated in the task, by means of a detailed compliance/ deviation chart as indicated in APPENDIX-A, to be enclosed with the proposal.

The contents of this RFP are strictly meant for generating a development proposal to CAIR against this tender enquiry and they are to be treated in confidence and are NOT to be revealed directly or indirectly to the press, public or to any entity not concerned with generation of the development proposal. This RFP will be executed in an Agile manner in conjunction with a fixed price contract.

2. General Guidelines for Design and Implementation

2.1) All components of the development pipeline (compilers, libraries, designing tools, testing tools, debugging tools *etc.*) will be Open Source. In addition to Development the selected Partner shall give support to the open sources used in this project.

2.2) The code is expected to be heavily unit tested with >= 95 % unit test coverage.

2.3) FIT (or a similar open source tool) based functional tests are mandatory with >=95 % code coverage.

2.4) Elegant OO Design is mandatory. Design patterns should be suitably used. Each class should be less than 300 lines in length and each method should have an average of 15 lines of code (with an acceptable standard deviation of 2). If more than 15 lines are needed to code then a strong exception justification should be provided.

2.5) Continuous Integration - All check-ins must trigger a build (including tests). A separate build server will be maintained. Burn-down charts will be generated from the build. Every week a tagged build must be made available to CAIR with burn-down charts.

2.6) Besides Javadocs, a wiki-based design documentation is mandatory. This must be updated every week. Documentation for every logical piece of construct within the code is mandatory.

2.7) Explicit tracking of bugs and change requests on Trac project management tool.

2.8) Version control through an open source version control tool like Mercurial.

2.9) The software will be developed with the following opensource tools/ languages/technologies:

(i) Junit / JSPUnit Test Framework

(ii) Eclipse IDE / Netbeans IDE

(iii) Java/J2EE (open jdk) Code should be compatible with future releases

(iv) Tomcat Application Server

(v) Mercurial Version Management

(vi) Trac Project Management

(vii) Javadoc / Doxygen / JSPDoc: API documentation

(viii)Distributed-DBMS: Cassandra

(ix) DROOLS

The System shall be developed on Linux OS, three tier Information Architecture-standard Browser based front end thin clients, Tomcat Application server based middle ware and Cassandra based back end distributed data base will be the platforms for development. OWL based ontologies will constitute the knowledge base. J2EE – MVC (Model View Controller) architecture support should be provided with JSP components. The XML & JSP should be compliant with XHTML and should provide support to all browsers.

2.10) The solution should run on OSGi based JEE containers to ensure modularity, isolation and versioning. The JEE platform and the solution should be able to integrate with highly scalable and available data grids and messaging systems for better performance, availability and scalability.

2.11) **Installation:** The solution should provide installation scripts, which will enable it to be effortlessly installed on both Windows and Linux machines.

2.12) **Implementation of Nonfunctional Requirements**: There are certain non-functional system requirements to be implemented and realized for proper functioning of the system as a whole. These nonfunctional requirements are to be specifically analyzed and addressed by the DP under this contract. Some of the nonfunctional requirements are listed in APPENDIX-B. This list is not exhaustive and additional requirements may be added as necessitated during testing and evaluation of the developed software.

2.13) **Integration Build Philosophy**: A Build is an operational version of a system or part of a system that demonstrates a subset of the capabilities provided in the final product. Builds are integral parts of the iterative life cycle and will be driven by test cases. Each build provides early review points to uncover integration problems. The project will

follow an agile development workflow. The build cycle periods can be decided with the development team. The functionalities of the system to be realized in each successive build have to be identified as part of the detailed analysis task. The DP shall give support for testing of the system to be carried out at CAIR.

2.14) **Cross Platform Compliance** (Windows and Linux): Although the development effort will be on Linux the solutions should seamlessly and effortlessly integrate and run on both Windows and Linux platforms.

2.15) **Parallel Processing**: The development effort should:

- Take advantage of parallel processing for time-consuming tasks.
- Should be able to leverage a simple yet powerful framework that will break certain analytical / data processing jobs into tasks, distribute the tasks to a cluster of commodity machines (when available) and aggregate the results.
- The solutions should be highly concurrent and be able to take advantage of multi-core processors. Use tools to minimize pitfalls with multithreaded code.

3. Work Statement

S.No	Task Description	Task Priority
Task A	**Existing software upgradation**	2
A.1	Integration of User Management with Accessibility Permission & Security Classification to all DSS.	2.1
	• Allow the user to single sign-on and access all applications.	
	• Visibility of all resources/artifacts will be governed by fine-grained policy based authorization based on user's appointment.	
	• All permissible operations by users' shall be governed by fine-grained policy on permissible operations.	
	• Allow for controlled time-based delegation of authority.	
	• Allow for dynamic creation and assignment of policy and appointments by authorized user.	
A.2	GUI changes for flexible screen size, increased font size, collapsible panels *etc.*	2.2
	• GUI should give display consistently at various resolutions.	
	• GUI enhancements to improve screen real estate management and focus on showing primary visual elements.	
	• Use collapsible panels to decrease screen clutter yet provide access to important data.	
	• Support large fonts to improve readability.	
A.3	Graceful handling of exceptions when DSS cannot generate a solution.	
	• System to be resilient in the face of missing data.	
	• Appropriate messages to be presented to the user.	
	• Appropriate system resources to be released during exceptional conditions.	
	• The system should not crash.	
A.4	Data life cycle management for data components of DSS including Move Orders (MO)	2.4

S.No	Task Description	Task Priority
	• Maintaining/Extracting from archives.	
	• Defining the time range for archiving *etc.*	
	• Auto-scheduling of archive generation as per defined time periods.	
A.5	Decision Support Systems	2.3
	Deployment DSS	
	▪ Extend the solution to allow deployment at Corp level.	
	▪ Allow solution to be saved in appropriate case-base.	
	▪ Tuning the DSS for memory and performance optimisation.	
	▪ Resilience of system.	
	Transport Allocation DSS	
	▪ Extend solution to handle 'Do-Not-Extract' Request flow.	
	▪ Extend existing solution to allow creation/saving/access of multiple strategies for allocation.	
	▪ Extend existing solution to raise notification/alarm for Released-Under-Collection and Off-Road cases.	
	▪ Extend existing solution to allow validation of raised request by Brigade.	
	▪ Evolve Plan management for process request.	
	▪ Allow solutions to be saved in appropriate case-base.	
	Convoy Composition DSS	
	▪ Allow solutions to be saved in appropriate case-base. ▪ Re-architecting Convoy Scheduling with Graph DB instead of JDSL	
	Convoy Scheduling DSS	
	▪ Allow solutions to be saved in appropriate case-base.	
A.6	DSS Framework	2.4
	• Integrating the Glance module with the workflow.	
	• Generating reports for relevant DSS.	
	o Additional reports for capturing KPI (Key Performance Indicators) of the application	
	o Graph based views and textual views of most reports.	
	o Allowing drilling down from summary reports.	
	• Storing Ontologies in Semantic Database.	
	• Switching of Cassandra from v0.6 to the latest version.	
Task B	**Service Oriented Architecture (SOA)**	1
B.1	SOA Implementation	1.1
	o Implementation and establishment of a service-oriented architectural framework:	
	▪ Establishment of required features essential for the SOA layer like service publishing, service discovery, service selection and ranking, service invocation, data adaptation.	

S.No	Task Description	Task Priority
	○ Establishment of Knowledge base/ Rule Engine for SOA:	
	▪ Creation and establishment of Ontologies.	
	▪ Establishment of Rule Engines to enable representation of the domain and services which are deployed.	
	○ Integration of SOA layer with Knowledge base/ Rule Engine	
	• Distributed TupleSpace design and implementation:	
	▪ Implementation of the distributed TupleSpace for coordination and communication among different services.	
	• Implementation of the semantic layer for providing semantic capabilities to SOA implementation.	
Task C	**Deploying the SOA layer on autonomous platforms.**	1
C.1	• Establishment of Path planning, task-coordination, Simultaneous Localization and Mapping (SLAM) algorithms.	1.1
	▪ Establishment of a simulation environment for the ground and aerial autonomous mobile platforms.	
	▪ Implementation of the path planning algorithms for the aerial autonomous mobile platform	
	▪ Implementation of the path planning algorithms for the ground autonomous mobile platforms	
	▪ Establishment and testing of the implemented algorithms on the simulation environment	
	▪ Porting of the algorithms on the physical platforms.	
	▪ Implementation of SLAM algorithms.	
	▪ Testing of SLAM algorithms on Simulation environment.	
	▪ Porting to tested algorithms on to the physical platforms.	
	▪ Implementation of algorithms for collaboration among the autonomous systems	
C.2	• Establishment of Scene Interpretation and object recognition using sensors mounted on the mobile robots.	1.2
	▪ Implementation of module for Data acquisition in the form of PointCloud format and its preprocessing	
	▪ 3D Scene Interpretation:	
	○ Implementation of Segmentation & Extraction of Planes' Algorithms.	
	○ Implementation of module for Identification & labeling of Planes.	
	▪ Object Detection / Recognition :	
	○ Implementation of Clustering Algorithm. (Clustering of points in 3D space and high-dimensional space).	
	○ Implementation of Extraction of Objects.	
	○ Implementation of algorithms for the generation of feature descriptors for each cluster of points.	
	○ Implementation of algorithms for Object Detection & Recognition using Machine learning techniques and Heuristic Rule Based Techniques.	
	▪ Establishment of Cognitive layer on Mobile Robots.	

4. Software Releases Philosophy:

A release is an operational version of a system or part of a system that demonstrates a subset of the capabilities provided in the final product. The software will follow the agile development cycle. The release cycles and tasks achieved in each release can be described by the DP in the proposal to this RFP.

5. Time Frame for development:

The total duration of development activity is 15 months from the start of the work. The work statement Task-A and Task-B will be executed from the start of the development contract whereas the work statement Task-C will be executed after six months from the start of the development contract. The DP can define the milestones for the complete software development in the chart defined in APPENDIX-C. A guideline is provided in APPENDIX-C which can be modified.

6. Platform Upgradation:

During software development, it is likely that some of the platforms chosen for implementation may become obsolete or newer versions with enhanced functionalities may become available. In such cases, switching over to the newer versions will be done in discrete steps without affecting the total time plan of contract. The latest version available at the time of deployment is to be used depending on feasibility and other factors to be discussed and agreed mutually at the relevant time.

7. Multi-user Environment:

The software system should support multiple users with least performance reduction under three-tier architecture.

8. Testing Support:

The testing of the entire software will be carried out at CAIR, Bangalore. Support of the development engineers/professionals of the DP should be made available during the testing. All shortcomings and bugs noticed during testing will have to be rectified by the DP.

9. Stubs and Driver Routines:

Wherever required, the stubs and driver routines will have to be developed by the DP to test and prove the developed software.

10. Quality System:

The software should be developed under quality system using Agile procedure. All steps towards Quality Assurance and Quality Testing will have to be taken from the beginning of the contract. Nominated Quality Assurance/Control role players should be positioned at CAIR during development. No delivery should be made without proper testing and related test artefacts, test evaluation, summary and test results should be made available with each delivery. The system should be designed for usability, functionality, robustness, scalability, configurability, portability, reliability, maintainability and supportability. Quality should be built into the system from the beginning by means of internal processes and checks.

11. User Interface:

The software must have a simple and easy to understand interface for the users. There should be ample facilities to support, assist and navigate or guide the users through the entire system. The software should provide extensive on-line help facilities for each screen, function, field and context. There should be a mechanism to simplify and support data entry

including proposed default values and prompts for posting of recurring entries. There should be extensive search facilities. All modules of the system must have flexible and powerful facilities for queries and reports. The user should be able to carry out both standardized and user defined queries/reports. There should be facilities for graphical representations of results, for export of results and other data to other applications, including presentation programs, word processors, electronic spreadsheets, databases and web sites.

12. Security:
The developer should identify extremely sensitive data in consultation with CAIR, and chalk out a strategy for storing the same in a high security environment in consultation with the customer. The design should allow substitution of encryption and decryption mechanisms by newer, customized solutions that might be developed by CAIR in-house and could be both hardware and software based.

13. Context Sensitive Help:
Extensive context sensitive help has to be provided. The context sensitive help will be both screen and field based. Every field of the GUI screen should have context sensitive help. In addition, extensive on-line help for system configuration and usage should be provided with a view to minimize reference to hard copy user manuals.

14. Database:
The design of backend database with Cassandra as required will form part of the contract.

15. Software & User Documentation:
The DP should supply a set of all software and user documentation in CD based softcopy and the approved copy of the final set in one hardcopy. All the software artefacts should be regularly maintained to highlight revisions and the causes of revision. The firms will ensure that the documents are kept current as per the changes /modifications in the software.

16. Supply of Source Code:
The source code for the application software should be provided with proper documentation explaining the functions of each module/routine. The final version of the complete source code will have to be compiled in front of the CAIR user and submitted along with all the necessary documentation. Necessary instructions for incorporating any modification changes in the software and its compilation into an executable/installable product should be explained clearly. All source code will become a proprietary item of CAIR. It must be understood that the software will be developed for the Ministry of Defence as a dedicated and a classified project. Entire software and other details will be made available to the Ministry of Defence and it cannot be utilized for any other purpose without specific clearance from CAIR.

17. Training:
A professional CBT (Computer-Based Tutorial) on the use of application software should be made and provided by the DP before the final sign off. The CBT will be used to impart on-site training for all the short listed users of the system.

18. Deliverables:
List of technical documents to be generated and supplied is given in APPENDIX-D. All final software deliverables will be both in soft copy media and one hard copy form.

19. Acceptance

i. Application Software Acceptance Testing: Delivery of the application software will be at CAIR. The product will be subjected to a mutually acceptable Acceptance Testing Procedure (ATP). The DP and CAIR will work out the details of testing jointly. CAIR will issue a product acceptance certificate on successful completion of testing of each release. The warranty for the product will commence from the date of issue of final acceptance certificate consequent to the final release.

ii. Data and Knowledge Base creation: Minimum historical data entry for automated system to start up would be the responsibility of the DP. The DP shall provide necessary hand holding support to CAIR during this phase.

20. Warranty and System Maintenance:

The DP will give reliability guarantee for the complete system. A methodology will also be worked out by the DP by whom the system (Software) will be under warranty for a period of one year after the implementation, integration, testing and completion of the application. The DP will provide bug fixes of the software along with upgrade releases. The DP will provide warranty support for a period of one year from the date of final accepted version of the software. The broad support which will be provided by the DP during the warranty period will include:-

- Provision of support engineers with the user for hardware and networking.
- Analysis and bug fixing for application software when notified.
- Enhancement, if required by the user.
- System training as per the scope and syllabus.
- Provision of patches/updates/bug-fixing for open-source software.
- Free replacement of all hardware, networking components and other equipments supplied by the DP.

21. Conditions during Warranty:

The system should fulfil the following conditions during the warranty and subsequent Annual Maintenance Contract (AMC):

All enhancements and rectifications to the application software keeping in view the change in policies and processes will be covered by the Warranty. The Warranty will be a comprehensive contract undertaken by the DP from a long-term perspective. This implies that the DP shall be legally bound to support the customer for keeping the system up & running under all circumstances. Any failure in the system or sub-system thereof should be rectified within one week of lodging a complaint, including loading of operating software, if required.

22. Timeliness:

Timeliness of execution and delivery are very crucial in this development as concurrent software development activities are planned to be executed and the outputs of all these developmental activities are to be periodically integrated to achieve the total system in an incremental method. As such, agreed delivery schedules are of paramount importance and should be strictly adhered to.

23. Technical Bid Details:
Broad overview and scope of work as understood by the company should be presented in the technical bid. The documents to be submitted along with the technical bid are listed in APPENDIX-E.

24. Study of Documents:
In order to enable proper assessment of effort estimate for these activities and then offer a Techno-commercial bid against this enquiry, the existing DSS developed in-house will be made available on CAIR premises for suitable study. The schedule details for the same will be given during the pre-bid workshop.

25. Project Team Composition:
The company should clearly bring out the team size to be inducted and positioned at CAIR and their skill sets. The role of each individual in the team shall be identified at the beginning of the development activity. This will involve identifying Project Manager, Solution Architect, Technical Lead, Module Lead, Test Lead, Senior Software Engineer, Software Engineer, Test Engineer, Technical Writer and User Experience Lead. The skills of the team members should be commensurate/in-tune with the technologies being pursued in the project. The skill-set requirement and the team composition as **minimally assessed** by CAIR for meeting the scope of this project is detailed in APPENDIX-F. The actual composition may be more as per the understanding of the scope of the project by the company. All team members/team lead to be inducted for this project will be screened by CAIR for technical suitability and competence. Any team member not performing up to the mark and not meeting project requirements in terms of allotted task completion within the framework laid out will be withdrawn by the DP and suitable replacements will be provided without any time gap. The DP will not rotate the manpower among their various ongoing projects, if any.

26. Effort Estimate and Manpower Loading:
The month wise man power loading per task will be separately indicated in the technical bid as per APPENDIX-G.

27. Mode of Selection:
The competitive technical bids along with un-priced commercial bids submitted by various Firms will be evaluated by a duly constituted Evaluation Committee for this purpose and the Firms technically found suitable and acceptable to undertake the work under this tender enquiry will be short listed. The process of evaluation will be detailed in the pre-bid workshop. The priced bid should be submitted separately. The Lowest bidder (L1) among these short listed Firms will be awarded the contract. Negotiations, if deemed fit; will be carried out with this chosen Firm. Lowest bidder (L1) will be decided based on the total cost for all the chosen tasks

28. Vendor Eligibility Criteria
Bidders who fulfill all of the following eligibility criteria would be considered for evaluation:

28.1) General:

28.1.1) The bidder should be registered in India and have been in existence for the last three years.

28.1.2) The bidder should have a development centre in Bangalore.

28.1.3) The bidder will have to provide an audited financial statement the last three years along with the tender response.

28.1.4) The Bidder should be registered for Service Tax and Income Tax in India.

28.1.5) The Bidder should have executed at least one software development project for Govt. of India.

28.1.6) The Bidder should have a Managed Services support wing to take care of Infrastructure Management for this project.

28.1.7) The Bidder should have R&D Services wing to take up DRDO projects.

28.1.8) The Bidder should have dedicated Hardware, Software and Testing practices.

28.1.9) The Bidder should have experience in creating Intellectual Property (IP) in-house in terms of frameworks, tools, products etc.

28.1.10) The Bidder should be CMMI Level-3 or above certified.

All the above must be substantiated through suitable documentary proof in support as provided in the formats for submission. Bidders may note that Consortium or outsourcing of work is not allowed.

28. 2) Technical:

28. 2.1) Must have experience in OO based software development.

28. 2.2) Must have experience in Open-Source based software development.

28. 2.3) Must have experience in Software Development in Java/J2EE Technologies based applications.

28. 2.4) Must have experience in developing complex multi-threaded, scalable, net-centric applications.

28. 2.5) Must have experience in Software Development in distributed Database applications using Cassandra.

28. 2.6) Must have experience in Software Development experience in Windows and Linux platforms and should have developed cross-platform applications.

28. 2.7) Must have experience in Software Development with proven competencies in Tomcat Application server.

28. 2.8) Must have In-House expertise in Windows and Linux platforms.

28. 2.9) Exposure/Experience with Artificial Intelligence domain desirable.

28. 2.10) Exposure/Experience with Algorithm implementations (e.g. Greedy algorithms] in Artificial Intelligence domain desirable.

28. 2.11) Exposure to Distributed Systems Programming desirable.

28. 2.12) Exposure/Experience with Multi-Agent System using AI techniques desirable.

28. 2.13) Exposure/Experience with Decision Support Systems using AI techniques desirable.

28. 2.14) Experience in handling large data sets during development of Software Applications.

28. 2.15) Experience in using/utilizing robust Open-Source based Messaging Systems during Software Application development.

28. 2.16) Experience in developing OSGi based Software Application Systems desirable.

28. 2.17) Should have good pool of resources exposed/experienced in and be able to translate the implementations in Java for:
28. 2.18) Dataware-housing technologies – Knowledge Base
28. 2.19) Business Intelligence – Analytics

28. 2.20) Exposure to Ontologies desirable.

28. 2.21) Should have executed large scale projects with Agile process and should demonstrate Agile capabilities.

28. 2.22) The bidder should have successfully designed, developed and implemented a minimum of three (3) of the following in last three (3) years:

- Java/JEE Technologies.
- Core Java based multi-threaded server applications.
- Dataware-housing technologies.
- Business Intelligence.
- Database Management.
- User Experience.
- Framework Development.
- Tools development.
- Open Source based projects.

Financials:

29. Fixed price:

This contract will be a fixed price Contract. All applicable levies and taxes shall be included in the prices to be indicated against each item. Time and Material cost will not be accepted.

30. TDS:
Tax Deduction at Source (TDS): Income Tax at applicable rate will be deducted at source on every payment to be made under this proposed development contract.

31. Liquidated Damages (LD):
If the DP fails to complete in full, all delivery and implementation according to the delivery schedule agreed upon, the DP will have to pay CAIR liquidated damages, at the rate of 0.5% of the values given for application software for each complete week or part thereof, for delay up to a maximum of five percent (5%) of the value of supply order. Thereafter, CAIR will have the right to terminate the contract in case of such delay beyond 10 weeks, and CAIR would have the option to execute the project from the market at the DP's risk and cost. The mode and method of such risk purchase would be at the total discretion of the customer.

Method of Payment of Liquidated Damages: Director CAIR would deduct, from the amount due for payment to the DP, the amount charged as liquidated damages. If the amount of such LD exceeds the payments due to the DP, the DP shall within 30 (thirty) days make payment to the customer in full and final settlement of claims failing which the bank guarantee will be encashed to make good the amount exceeding the payment due to the DP.

32. Venue for Development:
The development of software shall be carried out on the premises of CAIR, Bangalore. The DP will have to conform to the timings and working days of CAIR during the contract period. The requisite team of the DP will be positioned at CAIR, Bangalore. All resources – PC Systems, OS, Database, Application Server, Printers, Switches, etc., required for development will be brought in by the DP to CAIR on a returnable basis and cost of these tools and hardware platforms required for the development will not be included in the quote. Refer to APPENDIX-H for items to be brought in for development at CAIR. The quantity will be ascertained based on the teams being positioned for the effort.

33. Transport and Living Accommodation:
The personnel deputed shall make their own transport arrangement to place of work. No residential accommodation or free boarding to the DP's personnel will be provided by CAIR.

34. Security Checks:
The DP's personnel will be subjected to security checks and restrictions applicable within the CAIR premises. Police verification certificate for character and antecedents of personnel to be inducted for this development contract will be insisted upon.

35. Consumable Items:
All consumables like computer stationery, photocopy and printer papers, CD ROM media, and printer toner cartridges will not be supplied by CAIR and these are to be sourced by the DP. Due to security restrictions, all electronic and hard copy media once brought into the CAIR premises for the development work will be allowed to be taken out only after a low level formatting of the media has been performed.

36. Intellectual Property Rights (IPR):
i. The entire software developed under this contract shall be the property item of the Government of India and it will not under any circumstances be commercially distributed or exploited by the DP in direct or modified forms. DRDO will hold the IPR for the customized software including the source code, which will be delivered in totality before the beginning

of ATP at the end of each release. The DP shall have to execute a Non-Disclosure Agreement (NDA) when signing the contract. The engineers/professionals to be inducted for the development contract activities shall be subjected to security clearance / police verification, if required. System developed using open source software/libraries will be IPR of DRDO and should remain confidential. Complete source code of the product developed needs to be delivered.

ii. The DP will be required to give an undertaking that the proposed solution would in no manner be a violation of Intellectual Proprietary Rights (IPR) of any commercial organization and that the Indian Ministry of Defence would not be responsible towards any legal fallout at a later stage.

37. Contract Terms:
The development of software shall be carried out as per a contract agreement to be entered into. Specimen of contract terms will be made available for perusal, on request, as per schedules specified in the pre-bid workshop.

38. Contract Review, Audit & Termination:
In this software development, at the end of each software release, Technical Review/Audits will be conducted by a Project Review Committee, specifically to determine whether the software work carried out under that task is satisfactory, meeting the overall project and user requirements of timely completion and delivery of Quality software packages. In case the progress is not satisfactory in terms of timeliness, Quality and completeness and if it fails to meet the Terms and Conditions of the DP partner will not be allowed to take up and proceed with the succeeding builds.

39. Open-source Licenses:
The DP will have to ensure that all the open-source software used for the development is under LGPL, BSD or some such suitable license. The DP will be required to give an undertaking that the proposed solution would in no manner be a violation of licenses of any of the open source software used and that the source code developed will not be needed to be exposed/uploaded to the open-source community anytime in the future. The Indian Ministry of Defence would not be responsible towards any legal fallout at a later stage.

40. Proposed Payment Details for all Tasks:
The payment schedule can be defined by the DP which should commensurate with the progress of the development contract. A sample schedule for the build release, work to complete and time period of the build for the development contract is defined in APPENDIX-C. However 10% of the contract value will be retained till the completion of the warranty period. Alternatively the 10% payment can be claimed against submission of a Bank Guarantee for the equivalent value issued by a Nationalized Bank valid up to warranty period.

41. Additional Work:
In case of an extension of the same project for enhanced work scope the man month cost should not exceed more than 10% of the cost finalized for the main contract.

42. Copies of Proposal:
Two copies of the technical proposal should be submitted.

43. Compliance and Comments:
Para/Item wise Compliance and Comments to each of the above points 1 to 44 and for the Non-Functional Requirements should be provided as per the template given in APPENDIX-A.

44. Price Quote:
The quotation for this development contract will specify clearly the total cost for the contract, giving break down for the various tasks, per phase, as detailed below:

S. No.	Particulars	Comprehensive Manpower Cost in Rupees, if any	Amount of Taxes, Levies, if any (in Indian Rupees)	Total Cost
1	Task - A			
2	Task - B			
3	Task - C			

45. Arbitration:
Any question or difference arising under the Contract (except as to any matter, the decision of which is specially provided for) shall be referred to the sole arbitration of the Director CAIR or to some other person appointed by him. The award of the arbitrator shall be final and binding on both the parties. The arbitrator shall be entitled to the time of award by consent of the parties from time to time.

46. Force Majeure:
If any delay in completion of development work arises from Force Majeure Circumstances defined here after or any other cause, which the purchaser may deem to be reasonable, such additional time as may be considered necessary by purchaser under the circumstances of the case may be allowed by him, provided that the contractor shall be responsible for keeping the purchaser informed of the circumstances which may lead to delay in completion of work immediately after such circumstances comes to the notice of the contractor and also immediately which such circumstances comes to an end. Force Majeure is defined as:

- Any cause which is beyond the control of the contractor.
- Natural phenomenon including but not limited to weather conditions, flood, earthquake and epidemics.
- Action of any Govt. authorities, domestic or foreign.
- Accidents or disruptions including but not limited to fire, explosions and breakdown of essential or equipment and power shortage.
- Transportation delays including but not limited to recognized force majeure or accidents.
- Strikes, slowdown, lock-ups and sabotages.
- Failure or delay in the contractor's source of supply or causes similar to the above.

47. Security Deposit:
The successful bidder is liable to submit a security deposit for 10% of the contract value by Bank Guarantee issued by scheduled bank valid till the final acceptance of the stores at CAIR, prior to the release of the supply order.

APPENDIX-A

Compliance Chart

If this chart is not filled then the proposal will NOT be considered.

S.No	RFP Item No.	RFP Item.	Compliant (Yes/ No)	Comments	List of Supporting Documents (where applicable)
1	2	General Guidelines for Design and Development			
	2.1				
	2.2				
	2.3				
	2.4				
	2.5				
	2.6				
	2.7				
	2.8				
	2.9				
	2.10				
	2.11				
	2.12				
	2.13				
	2.14				
	2.15				
	2.16				
2.	3	Work Statement			
	3.1	Task - A			
	3.2	Task – B			
	3.3	Task – C			
3	4	Software release Philosophy			
4	5	Time Frame for development			
5	6	Platform Upgradation			
6	7	Multi-user environment			
7	8	Testing Support			
8	9	Stubs and driver routine			

S. No	RFP Item No.	RFP Item.	Compliant (Yes/ No)	Comments	List of Supporting Documents (where applicable)
9	10	Quality system			
10	11	User interface			
11	12	Security			
12	13	Context sensitive help			
13	14	Database			
14	15	Software and user documentation			
15	16	Supply of source code			
16	17	Training			
17	18	Deliverables			
18	19	Acceptance			
19	20	Warranty and System Maintenance			
20	21	Conditions During Warranty			
21	22	Timeliness			
22	23	Technical Bid Details			
23	24	Study of Documents			
24	25	Project Team Composition			
25	26	Effort Estimate and Man-power loading			
26	27	Mode of Selection			
27	28	Vendor Eligibility Criteria			
	28.1	General			
	28.1.1				

S.No	RFP Item No.	RFP Item.	Compliant (Yes/ No)	Comments	List of Supporting Documents (where applicable)
	28.1.2				
	28.1.3				
	28.1.4				
	28.1.5				
	28.1.6				
	28.1.7				
	28.1.8				
	28.1.9				
	28.1.10				
	28.2	Technical			
	28.2.1				
	28.2.2				
	28.2.3				
	28.2.4				
	28.2.5				
	28.2.6				
	28.2.7				
	28.2.8				
	28.2.9				
	28.2.10				
	28.2.11				
	28.2.12				
	28.2.13				
	28.2.14				
	28.2.15				
	28.2.16				
	28.2.17				
	28.2.18				
	28.2.19				
	28.2.20				
28	29	Fixed Price			
29	30	Tax Deducted at Source			
30	31	Liquidated Damages			
31	32	Venue for Development			
32	33	Transport and Living Accommodation			
33	34	Security Checks			

		RFP Item.	Compliant (Yes/ No)	Comments	List of Supporting Documents (where applicable)
34	35	Consumable Items			
35	36	Intellectual Property Rights			
36	37	Contract Terms			
37	38	Contract Review, Audit and Termination			
38	39	Open-source Licenses			
39	40	Proposed Payment Details			
40	41	Additional Work			
41	42	Copies of Proposal			
42	43	Compliance and Comments			
43	44	Price Quote			
44	45	Arbitration			
45	46	Force Majeure			
46	47	Security Deposit			

APPENDIX-B

Non-Functional Requirements

(i) Data Base Replication: Application driven Data base replication routines among servers located at different locations across the network for all identified data elements will be developed, for failsafe operation of the system in times of hardware failures like disk crashes and system outages. Data needs to be synchronized as part of the application.

(ii) Automated Application Software Packaging and Deployment Tool

(iii) "Garbage Cleaning" of unwanted data from back end database must be done automatically at periodic intervals as a back ground process or as an invoked utility.

(iv) Failsafe shut down and restart of any server any time without affecting other servers and network operation. Any crash of a server machine should not bring down the rest of network/servers operation. Failure of a server must be detected automatically by built-in mechanism. When a server failure is detected, all clients connected to it must be transferred to the server of next higher level, which holds a replicated database.

(v) Login Statistics: Number of logins from each client machine and client ID with time period/stamping must be logged in. The details of print outs taken must also be logged in as report form. This detail should not be editable.

(vi) User Interface Screens: Data entry in all fields will be validated for correctness. Once sufficient number of valid data is keyed into any field, the cursor should automatically move to the next data entry field. Provision will exist to skip non-mandatory fields by Tab Key.

(vii) System is operable 24 hours X 7 days. Though this is primarily a hardware requirement, the software should support this requirement, wherever feasible through power down mode etc. System uptime shall be 99.99% on servers.

(viii) All entries into system will be through user input screen provided as part of application software.

(ix) Automatic data replication at Servers location will be provided. In addition provision to take back up data on a floppy/CD or suitable media and to load back the data shall be provided.

(x) Only authorized abbreviations (available with CAIR) will be used in all documents/artifacts and screen layouts.

(xi) Screen formats/layouts will be uniform in terms of color scheme, fonts, navigability etc. across the entire application.

(xii) Any deletion of database entry should be done after reconfirming the same from the client – e.g. "Do you want to delete this item?" In case of critical data, proper warning about the consequences should be provided.

(xiii) The system performance in terms of response time should not be degraded even when all clients are using the system and accessing the database. Response to any data base access should be less than 2 seconds, worst case, even at peak traffic and database accesses. (This is purely a tentative figure and could be fine tuned after a few rounds of integrated testing.)

(xiv) Error detection and recovery: System should be able to detect errors and be able to recover from such errors with minimum loss of data.

(xv) Software should lend itself to easy and effective maintenance. Adaptive, enhancive and corrective maintenance should be possible with least amount of effort.

(xvi) Software constraints: Software constraints (e.g. maximum field length, file size etc.) should be minimal and avoided at best. Where it cannot be avoided it should be user configurable.

(xvii) Recovery from crash: Software programs and data should not be corrupted or lost after system crash and must be recoverable with minimum loss of time. Necessary procedures should be provided to restore system following a major crash like Disk crash. This would include automatic replication of data across the network.

(xviii) System reconfiguration facility: System should not permit modification of application software or data structure to ensure integrity. The system should have facility of reconfiguration by designated staff to cater for changing requirements, e.g. when some servers have crashed, the clients connected to it must be transferred to nearby server in which replicated data is available.

(xix) Portability: Application software must be easily portable across later versions of same family of Hardware systems (e.g. Pentium range of PCs) and Operating systems (Linux Flavors), Middleware servers (Tomcat Upgrades etc.)

(xx) Report generation: Generation of reports will be in text, processed and formatted as a print out or text file. Generation of reports will be by authorized persons only. It should provide provision to modify formats and screens by the user. Facility for formatting the generated reports, seeing Print-Preview and taking printouts in Portrait/Landscape in A4/A3 size papers should be provided. Also facility for saving the reports and retrieving the same later for reference should be provided.

(xxi) Security aspects: Multi level database security measures. Dissemination of information on a need to know basis based on role-profile and the corresponding permission tuple. Transmission of data in encrypted form.

(xxii) Usage of unspecified COTS software products as part of Application Software should be avoided.

(xxiii) General aspects to be supported:

a. Scalability
b. Availability (24X7) - Item 13 above
c. Maintainability
d. Portability
e. Configurability

f. Usability
g. Supportability
h. Reliability
i. Reusability
j. Stability

(xxiv) Upgradeability: In terms of hardware platforms/ OS and other COTS products future versions; Issues due to H/W and COTS obsolescence.

APPENDIX-C

Milestones

Build	Work to complete	Time Period
1	• SOA Implementation	1-6 month
2	• Establishment of Scene Interpretation and object recognition using sensors mounted on the mobile robots. • Establishment of Path planning, task-coordination, Simultaneous Localization and Mapping (SLAM) algorithms	7-12 month
3	• Integration of User Management with Accessibility Permission & Security Classification to all DSS. • GUI changes for flexible screen size, increased font size, collapsible panels *etc.* • Graceful handling of exceptions when DSS cannot generate a solution. Data life cycle management for data components of DSS including Move Orders (MO) • Deployment DSS • Transport Allocation DSS • Convoy Composition DSS • Convoy Scheduling DSS • DSS Framework	13-15 month

APPENDIX-D

Deliverables

S. No.	Documents (using IEEE standards)
1	Software Wireframes
2	Mindmaps
3	Software Architecture
4	Java docs generated from code
5	Computer Based Tutorials
6	Test Plans
7	Test Cases
8	Test Reports

APPENDIX-E

LIST OF DOCUMENTS WHICH WILL ALSO BE SUBMITTED ALONG WITH THE TECHNICAL BID

1. Checklist provided with the bid should be correctly entered.
2. Detailed technical write-up highlighting the features of the system offered.
3. Information on the upgrade path for the system offered.
4. Details of all components of the system offered to include make, model, revision No, performance details, etc.
5. Any other document relating to the product that the DP may feel necessary to support the product offered.

APPENDIX-F

Team Composition & Skill Set Requirements

Roles and Numbers:

Role	Nos. [people]
Project Manager	1
Solution Architect	1
Technical Lead	1
Module Lead	2
Test Lead	1
Senior Software Engineer	3
Software Engineer	5
Test Engineer	2
User Experience Lead	1
Technical Writer	1

Desired Skill-set for the project team roles:

- **Project Manager**
  - Total of 15 years of experience.
  - PMP experience – 3 to 5 Years.
  - Managed minimum of 2 projects of cost more than 3 times the contract cost.
  - Should have managed project management cycle comprising of System Study, Design Specification preparation, Scheduling and Managing Development.
  - Exposure to CMMI/ISO processes with 10 years of application development handling.
  - Good exposure to Multi-tier architectures, Distributed Computing, Web technologies, Open-Source based development management.

- **Solution Architect**
  - Around 10-12 years of experience.
  - Excellent interpersonal and communication skills.
  - Excellent understanding and good working experience in OOAD, Java/JEE, Concurrent programming, Distributed Computing, Client-Server/Multi-tier architectures, Web technologies – technically hands-on with tools and related frameworks.
  - Very good algorithmic skills mandatory.
  - Architecting Enterprise level applications, handling the issues/resolving and related data flows *etc.*
  - Good understanding on Design Patterns and the related applicability in projects.
  - Good understanding and experience on Application Servers and the related applicability in projects – should be able advocate the suitability to address the architectural requirements.
  - Exposure to Multi-Agent System architecting and development is highly desirable.
  - Excellent understanding and experience on the Database Management Systems.
  - Should have provided architectural solutions keeping in mind on the non-functional aspects like Performance, Scalability, Reliability, High Availability, Internationalization/Localization *etc.*

- Good understanding on Application Security aspects like Authentication-Authorization, PKI, SSLs *etc.*
- **Sun Certified Enterprise Architect (SCEA) is highly desirable.**
- Exposure to CMMI/ISO processes.

- **Technical Lead**
  - Around 8-10 years of experience.
  - Minimum of 5 experience in architecting distributed systems.
  - Excellent interpersonal and communication skills.
  - Good knowledge of core Java, network programming and multithreading.
  - Excellent understanding and good working experience in OOAD, Java/JEE, Distributed Computing, Client-Server/Multi-tier architectures, Web technologies – technically hands-on with tools and related frameworks.
  - Good hands-on experience with Designing and realizing the same with UML aspects – Use Cases, Class diagrams, Sequence Diagrams *etc.*
  - Good understanding on Design Patterns and the related applicability in projects.
  - Good understanding and experience on Application Servers and the related applicability in projects – should be able to support the architect in deciding on the App Server.
  - Good experience in review process – architecture, design, code.
  - Good hands-on with design, coding, resolving the technical issues.
  - Good experience in WBS, effort estimations.
  - Excellent understanding and experience on the Database Management Systems.
  - Good understanding on Application Security aspects like Authentication-Authorization, PKI, SSLs *etc.*
  - Good exposure in dealing with solutions involving non-functional aspects like Performance, Scalability, Reliability, High Availability, Internationalization/Localization *etc.*
  - Experience in CVS tools like svn, Mercurial *etc.*
  - **Should be a Sun Certified Java Developer [SCJD].**
  - Exposure to CMMI/ISO processes.

- **Module Lead**
  - Around 6-8 years of experience.
  - Minimum of 5 experiences in architecting distributed systems.
  - Excellent interpersonal and communication skills.
  - Good knowledge of core Java, network programming and multithreading.
  - Excellent understanding and good working experience in OOAD, Java/JEE, Distributed Computing, Client-Server/Multi-tier architectures, Web technologies – technically hands-on with tools and related frameworks.
  - Good hands-on experience with Designing and realizing the same with UML aspects – Use Cases, Class diagrams, Sequence Diagrams *etc.*
  - Good understanding on Design Patterns and the related applicability in projects.
  - Good understanding and experience on Application Servers and the related applicability in projects – should be able to support the architect in deciding on the App Server.
  - Good experience in review process – architecture, design, code.
  - Good hands-on with design, coding, resolving the technical issues.
  - Good experience in WBS, effort estimations.
  - Excellent understanding and experience on the Database Management Systems.

- Good understanding on Application Security aspects like Authentication-Authorization, PKI, SSLs *etc.*
- Good exposure in dealing with solutions involving non-functional aspects like Performance, Scalability, Reliability, High Availability, Internationalization/Localization *etc.*
- Experience in CVS tools like svn, Mercurial *etc.*
- **Should be a Sun Certified Java Developer**

- **Senior Software Engineer**
  - Minimum 4-6 years of experience in Software application development.
  - Good understanding on OOAD aspects.
  - Good knowledge of core Java, network programming and multithreading.
  - Good hands-on experience in Java programming language.
  - Good hands-on experience in Java/JEE technologies.
  - Good hands-on with UML aspects.
  - Should be able develop application on Multi-Tier architecture.
  - Should be able develop applications Java Open source frameworks.
  - Good working knowledge on Databases.
  - Should be able to review the design and code.
  - Working experience in migration projects [C++ to Java] is an advantage.
  - Experience in CVS tools like svn, Mercurial *etc.*
  - **Should be Sun Certified Java Programmer [SCJP].**

- **Software Engineer**
  - Minimum 2 to 3 years of experience in Software application development.
  - Fair understanding on OOAD aspects.
  - Fair hands-on experience in Java programming language.
  - Should have experience in Java/JEE technologies.
  - Exposure to UML aspects is advantageous.
  - Should be able develop application on Multi-Tier architecture.
  - Should be able develop applications Java Open source frameworks.
  - Good knowledge on Databases.
  - **Advantageous if Sun Certified Java Associate [SCJA].**

- **Test Lead**
  - Minimum 6-8 years of experience in Software and Web application testing.
  - Good experience in test plans, test case design and related execution.
  - Experience in testing the Java applications using Open-Source tools.
  - Experience in CVS tools like svn, Mercurial *etc.*
  - Experience in testing Defence projects is an advantage.
  - Exposure to CMMI/ISO processes.

- **Test Engineer**
  - Minimum 4 years of experience in Software and Web application testing.
  - Experience in test case design and related execution.
  - Experience in testing the Java applications using Open-Source tools.
  - Experience in CVS tools like svn, Mercurial *etc.*
  - Experience in testing Defence projects is an advantage.

APPENDIX-G

Month wise Man power Loading chart to be filled

Phase of the project	PM	Solution Architect	Technical Lead	Module Lead	Test Lead	SSE	SE	Test Engg.	User Exp. Lead	Technical Writer
Total stay by role [man-months] – approx.										

PM: Project Manager
SSE: Senior Software Engineer
SE: Software Engineer

APPENDIX-H

List of items to be brought in by the DP on a returnable basis for executing the Contract on the development venue, CAIR, Bangalore. The quantity will be ascertained based on the teams being positioned for the effort.

a)	Open Source Software i.Junit / JSPUnit Test Framework ii.Eclipse IDE Java/J2EE (jdk 1.5) iii.Tomcat Application Server iv.Mercurial Version Management v.Trac Project Management vi. Javadoc / Doxygen / JSPDoc: API documentation vii.DBMS: Cassandra	**Qty**
b)	Printer	1
c)	Servers of following configuration: Intel core 2 duo or Xeon 5500 and above Clock speed @ 3 GHz (minimum) 4 MB cache, 1333 MHz FSB, 4 GB RAM	2 or 3
d)	PC Dev Platforms of following configuration : Minimum 3 GHz or above clock speed 17" LCD display 4 GB RAM 300 GB SATA HDD/FDD/CD ROM Drive Monitor/Key Board/Mouse I/O ports Linux OS 2 ports - 100/1000 Mbps Ethernet NIC card 4 ports - USB2.0	1 per person
e)	24 port Ethernet switches & network cables	1 set
f)	Computer Consumables, Stationery & Back up Media as required.	as required