

**Request for proposal for design, development, implementation  
and training of customized open source Desktop and Web GIS  
Application (Phase II)**

RFP No. AEDC/GIS/GARIIASI/2011/02 dated 25/10/2011

**Assam Electronics Development Corporation Limited (AMTRON)  
Industrial Estate, Bamunimaidan,  
Guwahati 781 021, Assam, INDIA  
Tel. No. 0361 -2724 222**

## IMPORTANT INFORMATION

<b>RFP Inviting Authority</b>	Assam Electronics Development Corporation Ltd., ( AMTRON)
<b>Request for Proposal (RFP) No.</b>	AEDC/GIS/RFP/2011/01 dated
<b>Sale of RFP document</b>	Downloadable from AMTRON's website URL: www.amtron.in
<b>RFP Document Purchase Price</b>	Nil
<b>Last date of downloading the RFP Document</b>	08/11/11
<b>Place of submission of proposal (Changes, if any, to be notified separately)</b>	Assam Electronics Development Corporation Limited, Industrial Estate, Bamunimaidan, Guwahati – 781 021.
<b>Address for correspondence</b>	The Managing Director Assam Electronics Development Corporation Ltd., (AMTRON), Industrial Estate, Bamunimaidan, Guwahati 781 021, Assam, INDIA Tel. No.+91 361 2724222
<b>Earnest Money Deposit (EMD) payable</b>	Rs. 1,00,000/- (Rupees One Lakh)Only in the form of Demand Draft of any Nationalised Bank in favour of Managing Director, Assam Electronics Development Corporation Limited) <b>(Individuals/Research Scholars/NGOs are exempted from submission of EMD)</b>
<b>Last date &amp; Time for submission of Proposal</b>	Upto 15:00 hours on 08/11/2011
<b>Date , Time and Venue of Opening of Bids</b>	15:00 hours on 08/11/2011 <b>Venue:</b> Assam Electronics Development Corporation Limited, Industrial Estate, Bamunimaidan, Guwahati – 781 021.
<b>Duration for completion of work</b>	Maximum 180 days from the date of issue of formal work order.
<b>Security Deposit</b>	Vendor must submit a BG amounting to 25% of the quoted amount with a validity of 1 year.
<b>Date , Time and Venue for inspection of Phase I of the software by interested individuals/parties</b>	Any working day during office hours at Assam Electronics Development Corporation Limited upto 08/11/2011

## **Preface :**

Assam Electronics Development Corporation Ltd (AMTRON) having its registered office at the Industrial Estate, Bamunimaidan, Guwahati-781021, is the Nodal Agency of the Government of Assam for Information Technology. AMTRON has developed a customized Open Source Desktop GIS Application and a Web GIS Application under one ongoing project funded by Department of Information Technology (DIT), Govt. of India. The Desktop GIS Application is named as **“GARIIASI” (GIS And Remote sensing Integrated Initiative for Administrative and Social Infrastructure)** and the Web GIS Application is named as **“iGARIIASI”**. Both the application are developed using open source technologies with open distribution license. “GARIIASI” is developed mainly for the government departments using GIS or intending to use GIS for spatial data development which has become an integral part of decision making in recent time. Again, “iGARIIASI” is developed for e-governance.

Now, AMTRON intends to go for 2<sup>nd</sup> Phase of development of both the Desktop as well as Web GIS Application with new features/modules. The new features to be developed as part of this Phase II is given in detail in Annexure -II. The features already developed in the Phase I are briefly outlined in Annexure-I.

Proposals from individuals/research scholars/NGOs/companies are invited for design, development, implementation and training of open source customized GIS software.

The proposals must be submitted in two parts in two separate sealed envelopes.

Part I : Technical proposal

Part II : Commercial proposal

Technical proposal should contain three parts as listed below:

Part -A: Description of the Bidder (Company/Consultant/Research Scholar)

Part -B: Previous experience of the Bidder (URL links/Binary files in CD media to be enclosed)

Part -C: Duration for completion of the work

Bidders must quote for Desktop and web GIS Application separately.

Commercial proposals of technically short listed bidders will only be opened for evaluation.

The bidders need to give a comprehensive presentation covering their exercise in developing open source softwares / tools, proposed solution architecture, implementation timeline, execution method, implementation and training method and technical manpower availability. The presentation will be part of the technical evaluation process. The schedule of the presentation will be informed at later stage.

Intended bidders are requested to register at [www.amtron.in](http://www.amtron.in) for download of the RFP document in ODF only.

A brief description of the already developed Desktop and Web GIS Application is provided below for reference :

- a. GIS Engine : Grass
- b. Development language : QT & C++
- c. Database : Postgre SQL with PostGIS
- d. Web Development Language : PHP,
- e. WebGIS Engine : Openlayer, MapServer
- f. Operating System : Fedora

As part of this project existing software needs to be migrated to make it compatible on either one of the following OS platform :

- a. Red Hat Linux
- b. Ubuntu

Phase II of the software need to be also designed and developed on either one of the above two OS platforms.

Proposal must contain the preference of OS as mentioned above.

#### Qualifying Criteria:

1. Bidder must have capability of development of Open Source GIS application for any state/central govt. organization in India. Documentary evidence and completion certificate in this regard must be submitted alongwith the proposal.
2. Bidder must have a turnover of 5 crore for last 3 consecutive years. Individuals and NGOs are exempted from turnover criterion.
3. Bidder must have ISO or CMM certification on Software Development

## Annexure – I

“GARIIASI” is developed customizing the open source GIS Application “GRASS”. The development is done using QT & C++. Database used with the Application is PostgreSQL with PostGIS. Total 8(eight) modules are developed with various features as briefly mentioned below :

### **A. Data creation:**

- i. Facility for digitization of various features in different layers and setting layer properties or equivalent OR feature based digitization where the feature attribute table and geometry properties are defined beforehand.
- ii. Facility to display scanned files / image (both geo-referenced and non-georeferenced) on the screen
- iii. Easy to use and CAD like digitization tools for drawing lines, polygons, points with or without scanned file / image on the backdrop
- iv. Vector snapping feature for the drawing tools for snapping to end point, node, centre point, any point on line. Each snap to use different snapping symbol
- v. Raster snapping feature e.g. centre line follow, end of line, middle of line etc.
- vi. Either on the fly topology building or interactive error checking and topology building
- vii. Generation of unique ID for all digitized features
- viii. Facility to connect to attribute data table through key field
- ix. Export drawing files to .dwg, .dgn, .dxf, GML format and GIS file to .shp format
- x. Export/import vector capability to shp, eoo, mif, dgn, dxf, GML etc.
- xi. Export/import raster capability to img, hdr, (Geo) TIFF, jpg
- xii. Geo-referencing & Reprojection facility
- xiii. Editing of digitised elements with following features:
  - a. Deletion of line, line segment
  - b. Modifying element by node
  - c. Add node
  - d. Join two area features to make single area feature with automatic prompting for entering new key field ID value

- e. Splitting of single area feature by drawing dividing line with system automatically prompting for entering new key field ID
- f. Create line segments by entering coordinate points, calculating closing errors for closed line strings created in this fashion
- g. Create polygons from closed line strings with the option of keeping original line strings
- h. Topology creation, buffer analysis, overlay facility
- i. Equals, touches, crosses, overlaps, intersects, disjoint, within features for geometric objects spatial relationships
- j. Union, intersection, XOR, NOR, NOT etc. operations on geometric objects as per OGC specifications.

## **B. Visualisation and editing of existing data:**

- i. Open and display of existing GIS and CAD files of standard format. GIS files maintain geographic reference, projection and coordinate system
- ii. Probe geographic coordinates at any point on the map through simple mouse click
- iii. On the fly projection transformation for features to the projection system of the selected base feature
- iv. Facility to set display scale dependent viewing of features
- v. Facility to probe attributes data on simple mouse click
- vi. Change style, colour, thickness of the features
- vii. Edit graphics feature geometry, feature attribute data, attribute table structure
- viii. Facility for thematic mapping based on attribute data
- ix. Labelling of features by selected attribute value
- x. Automatic conflict resolution in label positioning

## **C. Query and analysis:**

- i. Selection and highlight of features through simple query on feature attribute data
- ii. Query builder with simple interface
- iii. Saving of selected feature in different layer
- iv. Spatial query involving union, intersection, overlap and user specified conditions

- v. Simple spatial query builder interface with facility for SQL based query/spatial query building
- vi. Generation of buffer zone around feature based on user defined radius OR selected attribute data value
- vii. Simple and complex arithmetic and statistical operation on attribute data
- viii. Updating of attribute data field through SQL based query
- ix. Shortest route analysis, trace path, flood and other network analysis methods

#### **D. Database:**

- i. Database is common for all modules
- ii. Client updations in the data can be validated at server side by administrator before committing updation
- iii. Facility for creation of different users and assigning work to them by the administrator.

#### **E. Cartography:**

- i. Cartographic quality map compilation facility
- ii. Generation of map grids at user defined interval
- iii. Generation of tick marks
- iv. Generation of scale bars and change automatic proportionate change of scale bars with change in display / plot scale

#### **F. GPS data support:**

- i. Direct plotting of GPS data from GPS devices both online and off-line
- ii. Direct upload of feature attributes stored in GPS

## **G. Digital Elevation Model:**

- i. Plotting of X, Y, Z data from standard spreadsheet data table or ASCII data
- ii. Generation of contours from X,Y,Z values
- iii. Generation of DEM from X,Y,Z values OR tagged contours
- iv. Generation of Slope, Aspect maps with ability for reclassification and post classification processes such as merge, convert, convert to polygon with and without centroid (with or without attribute data such as ID, Area, Perimeter etc.)
- v. Generation of profile along user defined section
- vi. Calculate Cut-Fill values
- vii. Display view-shed analysis result with facility for defining viewers height

## **H. Image Processing:**

- i. Import and display of industry standard satellite imagery including IRS imageries Quickbird, IKONOS etc.
- ii. Geometric correction
- iii. Image enhancement tools
- iv. Image classification tools ( both unsupervised and supervised) and post classification tools
- v. Image cropping etc.
- vi. FCC viewing
- vii. Multiple band analysis based on simple mathematical rules such as (+, -, /, \* etc.)

The features of Web GIS Application “iGARIIASI” developed during Phase-I of the project are as follows:

- i. Able to display dynamic GIS data and maps over internet
- ii. Able to connect to standard GIS data including .shp, .ecw, .dwg, .dgn
- iii. Run on LINUX platform
- iv. Support all standard internet browsers
- v. Does not require any license fee for distribution of data through web using the Web GIS software
- vi. Able to serve map and data requests from any number of connected users simultaneously
- vii. Common display manipulation tools e.g. zoom in, zoom out, pan etc.
- viii. Display dynamic scale bar
- ix. Facility to display legend bars
- x. Possible to create theme maps
- xi. Able to create buffer
- xii. Able to perform spatial and attribute query in user defined pre-designed format
- xiii. Allow import/export of data/image/objects in GML format for authorized users

## Annexure – II

The required features to be developed in the Phase- II are mentioned below.

### **Desktop GIS Application (GARIASI)**

1. Georeferencing Functionality :
  - a. Image to Image registration
  - b. XY vector Layer to Georeferenced Vector Layer
  - c. Updating existing Georeferencing library with latest available Georeferencing scripts (as per latest PROJ 4)
  
2. Topology Tools :
  - a. Build Topology
  - b. Edit Topology with following options
    - i. Breaking lines at intersection
    - ii. Remove duplicate features
    - iii. Remove Dangles
    - iv. Snap Lines to vertex in threshold
    - v. Remove duplicate area centroid
    - vi. Remove vertices in threshold from lines and boundaries
    - vii. Remove small areas
    - viii. Remove all lines or boundaries of zero length
    - ix. Remove small angles between lines at node (applicable for only those angles which are so small that the calculated angle at any time is zero.
  - c. Builds poly line from line and polygon
  
3. Facility to create user defined customized map projection
  
4. Drill down through multiple layers (Raster/ Vector): Functionality for interactively query the category contents of multiple raster / vector map layers at user specified locations within the current geographic region.
  
5. Facility to generate multiple buffer rings for point, polyline and polygon.
  
6. Facility of dissolving/aggregating vectors based on specific attributes.

7. Conversion of line to polygon, polygon to line and polygon to point.
8. Thematic map: Grid to provide different range of intervals with different colors.
9. Cartography :
  - a. Flexibility to add North arrows, scale bar, legend on viewer window
  - b. Flexibility of taking printouts through plotters.
  
10. Dissolves boundaries between adjacent areas sharing a common category number or attribute.
11. Finds the nearest element in vector map 'to' for elements in vector map 'from'
  
12. Image Processing :
  - a. Classifying images with KNN classifier with following distance option
    - i. Euclidean Distance
    - ii. Mahalanobis Distance
  - b. Post classification functionalities as
    - i Reclassification
    - ii. Recoding
    - iii. Error Matrix for classification accuracy assessment
  - c. Raster Image Processing & Operations (Logic & Analysis)
  - d. Generation of spectral response curves for supervised classifications
  - e. Image fusion of multi-spectral and pan imageries
  - f. Mosaicking of georeferenced images
  - g. Layer stacking
  - h. Generation of NDVI image(Normalized Difference Vegetation Index)
  - i. Principal Component Analysis
  - j. Band rationing
  - k. Resampling facility of raster
  - l. Reclassification of raster according to equal interval, defined interval, natural breaks(Jenks), geometrical interval, standard deviation etc.

13. Surface interpolation with vector points using following methodologies :

- i. IDW
- ii. Spline
- iii. Kriging

14. TIN generation and convert TIN to raster.

15. 3D GIS : 3D GIS will allow users to realistically render multiple surfaces in a 3D space, optionally using thematic coloring, draping GRASS vector maps over the surfaces, and displaying GRASS site files either draped on the surfaces or as 3D point locations.

The viewer will have the following functionality:

- i. Intuitive navigation
- ii. Interactive lighting controls
- iii. Multiple surfaces, multiple attributes, multiple masks
- iv. Raster, Vector, Site data in one 3D space
- v. Visualization for volume data to be added
- vi. Animation made easy through scripting or key frames
- vii. 3D point-and-click query and measuring
- viii. Arbitrary cutting planes

16. Extruding flat vector object to 3D with defined height

17. Layer based Layout

18. There should be provision to upload scripts (basically .scr text files which can have commands akin to AutoCAD and other CAD packages, or Gariiasi commands for making repetitive processes easy)

19. Topology objects, centroids ability to have their own attribute tables (say point must have a x,y table, line must have x,y, and length tables etc. And these tables should be available to make use of in queries and thematic mapping).

20. Topology AND, OR, NOT, NOR, NAND, XOR etc. operations on two topological datasets, to result in a third topology (called resultant topology) with tabular attributes combined in a third table attached to the new objects.

21. Query and thematic mapping based on tables, object types and their mathematical operations such as AND, OR, XOR, NOT etc. on combination of topologies and layer properties.
22. Weights and scales in raster analysis, manipulation of existing layer of raster to get a new raster based on "AND, OR, XOR..." criteria & Weights values.
23. Summation of rasters multiplying each by their assigned weight using a common measurement scale and weights according to their importance.
24. Facility to implement multi-criteria analysis using AHP (Analytic Hierarchy Process).
25. Charting and graphing of data.
26. One survey (theodolite/ compass) and one forestry module
27. One in civil (road construction, alignment, cut & fill, price estimation etc).

**Web GIS Application “iGariiasi”:**

1. Multiple Layer (Map & Table) Query, Thematic map generation with user defined interval from data with user defined colors
2. Calculation of distance along a line
3. Attachment of Photograph, Video, Documents etc. with maps or points/polylines/polygons on a map
4. Mobile Computing
5. Raster Image Display
6. Uploading of maps by authorized users

**NOTE: The bidders may suggest additional features in addition to the features mentioned above..**