Yemen Mobile Digital Maps Specifications

Yemen Mobile announce a tender for buying high-resolution accuracy digital maps for radio network planning ,optimization , and simulation Yemen Mobile needs Geodata for RF Planning and Optimization and for civil and architecture tools applications

Yemen Mobile digital maps requirements and technical specifications

requirements:

- The maps should be derived from high-resolution stereo satellite imagery
- Geodata for RF and microwave planning & optimization simulation tools
- Products compatible with RF planning tools and ray-tracing propagation models
- Products compatible with Civil& architect tools.
- 2D & 3D data raster, vector and building polygons in complete data sets
- An extensive catalogue of terrain, clutter, 3D building models and vectors based on recent vintage imagery for Republic of YEMEN country and all YEMEN cities/towns
- Pre-and post-sales support in our country
- Update servicesupport guarantee for next years
- Datum:WGS84

TECHNICAL SPECIFICATION:

Digital map type	description	Application	Resolution	data layers	Area ,Square kilometer	Image source and date
Countrywide digital maps	whole country area (Yemen)	RF and microwave planning & optimization simulation tools and Civil& architect tools	30m	DTM, clutter & linear vectors orthoimagery & raster maps ,Text labels	550,000 sq. km	A very high accurate resolution.The accuracy of the source imagery and related mapping data should be at equal or higher resolution than that of the drived geodata set .and with latest imagery 2013
2D models	Secondary Yemen cities	RF and microwave planning & optimization simulation tools and Civil& architect tools	5m	DTM, clutter and linear vectors ,ortho imagery and raster maps	Around 1000 sq. km	
3D models	main Yemen cities	RF and microwave planning & optimization simulation tools and Civil& architect tools	1-3m	DTM, DHM (raster), building models, clutter, linear vectors & orthoimagery	1000 -10,000 sq. km	
Population models	Population density per sq. km estimates	RF simulation	--	Atoll traffic map		

1- **Regional Model**(Country model):

Include the whole country(Republic of Yemen) area with an area around 500,000 sq km

Region model products are supplied in all major RF planning formats

Countrywide regional model dataset includes each of the following:

- Digital Terrain Model (DTM)
- Clutter Model
- Vector Model
- Text Labels
- orthoimagery & raster maps

countrywide or regional models:
are required to be a medium resolution database that allows us to quickly visualize terrain and clutter over the whole countrey. It consists of the following integrated layers: digital terrain model (DTM), clutter, linear vectors. Additional raster map or orthoimagery layers should also be included. Text labels for important places, streets, parks, etc should be included too.

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Terrain model (DTM/DEM)

DTM represents elevations of ground surface, location and the shape of obstacles to wave propagation. It is based on topographic maps of 1: 200,000 scale + SRTM data or
A Digital Terrain Model (DTM) is a continuous model of ground-level land surface, represented by a digital raster grid with each grid cell holding an elevation value.
A DTM is a fundamental data input for radio propagation studies in that terrain blocks and reflects radio waves.

- Resolution: 30 m
- Derivation: SRTM; 1:50,000 to 1:200,000 scale topographic mapping
- RMS height accuracy: 10 – 40m (depending on data source and relief)
- Year of map capturing:2012-2013
- Classes: all terrain types

Clutter

Clutters describe the surface and built-up features which influence on radio wave propagation. They are classified into different classes: classes of built-up areas, water classes, classes of landscape andvegetation. Clutter refers to a Land Use/Land Cover classification of surface features which impact on radio wave propagation. These features are classed according to their physical and electrical properties.

Average obstacle height, local absorption power loss, co-efficients of correction and distance to clearing are some of the clutter-specific parameters that can be set and adjusted in propagation modeling. Image classification for RF propagation studies must accurately model clutter in terms of its influence on radio wave propagation.

Clutter is generally produced from multispectral satellite imagery where distinct classes of surface features can be delineated through spectral homogeneity and other characteristics. For certain classes such as water, forest and crop land we can employ supervised classification techniques. This is an automatic yet iterative process, the results of which are checked and rechecked for classification accuracy.

Most features of the built environment, however, are classified through manual photo-interpretation. The final clutter layer is a raster grid where each numeric cell value corresponds to a particular clutter class.

- Resolution: 30m
- Derivation: recent medium-resolution stereo satellite imagery
- Classes: Up to 17 classes
- Year of map capturing:2012-2013

Linear vectors

Vector data consists of the transportation network and other linear features of the map such as coastlines, rivers etc. Vector data are derived from the satellite images. Vectors, in the geodata context, refer to a format where all map data is stored mathematically as points, lines, and areas rather than as a raster grid or image.These vectors have location and attribute information associated with them.Linear vectors consist of the transportation network such as streets, main roads, secondary roads, highways and railways as well as other features such as coastlines and watercourses. These features are always digitized from the orthorectified and georeferenced satellite imagery and are classified through photo-interpretation and ancillary data from topographical maps and other sources of information. Derivation: recent medium resolution satellite imagery

- Classes: 7
- Standard classes include: *highways, main roads, secondary roads, railways, airports, inland water, coastlines*

Text labels:

text labels include names of towns, cities, villages, shops etc

Orthoimage

A high-resolution image tied to the data set to simplify the use of the geodata compared to the real world

2-2D models

AREA OF INTEREST

	City
	'Amran
	Ad Dali'
	Al Bayda
	Al Mahwit
	Hajjah
	Ma'rib
	Sa'dah
	Zinjibar
	Al Ghaydah
	Lahij
	'Ataq

DATASET TECHNICAL SPECIFICATION

2D city models dataset includes each of the following:

- Digital Terrain Model (DTM)
- Clutter Model
- Vector Model
- Text Labels
- orthoimagery & raster maps

1. **DIGITAL TERRAIN MODEL (DTM)**

- Resolution: 5 m
- Derivation: recent high-resolution stereo satellite imagery
- Year of map capturing: 2013-2014

2. CLUTTER MODEL

- Resolution: 5m
- Derivation: recent high resolution satellite imagery
- Classes: Up to 18 classes
- Year of map capturing:2013-2014

3-3D CITY MODELS

YEMEN MOBILE need 3D city models at various levels of detail. These city models can be deployed in various applications such as RF Planning, navigation and location-based services, and security, and news graphics. So our requirement 3D models for the YEMEN main cities in the table below.They are derived from stereo satelliteand aerial imagery, these models provideorthorectified high-resolution accuracy and arethe cornerstone of successful urban modeldevelopment and related RF planning.

AREA OF INTEREST

#	City
1	Aden
2	Al Hudaydah
3	Al Mukalla
4	Dhamar
5	Ibb
6	San'a'
7	Ta'izz

DATASET TECHNICAL SPECIFICATION of STEREO 3D MODEL

The STEREO 3D city model dataset includes each of the following:

- Digital Terrain Model (DTM)
- Clutter Model
- Vector Model
- BuildingHeights Model
- Text Labels

1. DTM (DIGITAL TERRAIN MODEL)

DTM represents the elevations of ground surface, location and shape of obstacles to wave propagation.

- Resolution: 1-3 m
- Derivation: 2014t high resolution satellite imagery
- Year of map capturing: 2014

2. VECTOR MODEL

Vector data consists of the transportation network and other linear features of the map such as coastlines, rivers etc. Vector data are derived from high resolution satellite images and large scale topographic maps.

3. CLUTTER MODEL

- Resolution: 1-3 m
- Derivation: 2014high resolution satellite imagery
- Classes: Up to 18 classes
- Year of map capturing: 2014

4. BUILDING HEIGHTS MODEL

Database represents the outline of built-up structures (buildings, bridges, towers and other obstacles) with attributive information of relative or absolute height of every object. BuildingHeights will be derived from **stereo-pairs of** high-resolution satellite images by stereo photogrammetric methods.

BuildingHeights Model will be delivered in vector or raster format in accordance with your planning tool requirements.

Parameters of accuracy	
Resolution (cell size)	3 m
Absolute Planimetric accuracy (x,y)	± 3 m
Building heights accuracy	1-2 m
• Minimum recognizable Building height: 2 m	

Sources:

Stereo pairs of satellite images with 0.5-1 m resolution. year: 2014

TEXT LABELS

Text labels will be taken from open-source datasets

№	Class Name	Class Description
1.	Cities	Names of cities
2.	Towns	Names of towns
3.	Villages	Names of other settlements
4.	Railway stations	Names of railway stations
5.	Water	Names of rivers, lakes, reservoirs, canals, seas

4- Population model

Probability coefficients are assigned to each value of each input variable, and a composite probability coefficient is calculated for each LandScan™ cell, independent of census data, which can then be used to apportion shares of actual population counts within any particular area of interest.

Resolution: 0.00833 decimal degrees; 1x1km cell-size

About Yemen Mobile RF simulation tools

ATOLL CDMA2000 1X and EVDO Radio Planning and optimization

As you know telecommunication networks radio planning or optimization of existing wireless networks should be continuously developing and there are many software tools that help for cellular network planning and optimization .
The the quality of the digital maps has a strong influence on the final planning decision in our radio-planning.
As a cellular operator our company (Yemen Mobile) is using ATOLL CDMA2000 1X and EVDO Radio Planning and Optimization software from FORSK which is a scalable, and flexible network design and optimization platform that supports wireless operators throughout the network lifecycle, from initial design to densification and optimization.

in addition to that Atoll allows CDMA operators to plan and analyze the evolution of their networks towards LTE, Atoll has many features including :

Network and Radio Parameter Modeling

- Network database
- Support for repeaters
- Radio configuration and channel modeling
- Radio Resource Management (RRM)
- Support for multiple carrier and frequency bands
- Carrier type modeling (1xEV-DO, 1xRTT)
- EV-DO Rev.B multi-carrier operation (RRM + frequency diversity gain)
- Full 1xRTT, EV-DO Rel.0, Rev.A, Rev.B physical channels management
- Forward/reverse Rev.A, Rev.B radio bearer modeling
- Hybrid-ARQ modeling

Traffic Modeling

- Modeling of voice and data services
- Support for multiple sources of traffic data
    - user distribution maps
    - live traffic data per service per cell
- service demand maps (raster/vector)

Simulation and Analysis

- State-of-the-art Monte Carlo CDMA simulator including RRM, rate downgrading, and multi-carrier allocation algorithms
- Modeling of mixed 1xRTT/1xEV-DO traffic
- Generation of prediction plots, based on simulations or on user-defined cell load figures, including:
    - Ec/Io pilot prediction plots
    - Forward and reverse link Eb/Nt prediction plots
    - Forward and reverse link 1xRTT SCH rate prediction plots
    - Forward and reverse link 1xEV-DO (Rev.0 and Rev.A) data rate prediction plots
    - Service areas (pilot + forward and reverse link traffic)
    - Handoff status prediction plots
    - Number of servers
    - Pilot pollution prediction plots

- Total forward link noise and noise rise prediction plots

CDMA2000/LTE Co-planning

- Site sharing
- Simultaneous display and analysis of CDMA2000 and LTE networks
- Inter-technology handover modeling
- Inter-technology interference analysis

Neighbour and PN-offset Planning

- Manual and automatic neighbour planning
- Multi-carrier neighbour planning
- Automatic PN-offset allocation
- PN-offset allocation analysis

Automatic Cell Planning - ACP (option)

- Automatic optimisation of network parameters to increase coverage and capacity
- Site selection and activation for greenfield and densification scenarios
- Antenna selection and parameter optimization (height, azimuth, and tilt)

The Atoll uses its database -including the parameters of the base stations, antennas, propagation models and system parameters- with the digital maps to perform its various functions .

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COVERAGE PLANNING

The objective of coverage planning phase in coverage limited network areas is to find a minimum amount of cell sites with optimum locations for producing the required coverage for the target area.
Coverage planning is normally performed with prediction modules on digital map database. The basic input information for coverage planning includes:

• Coverage regions

• Coverage threshold values on per regions (outdoor, in-car, indoor)

• Antenna (tower height limitations)

• Preferred antenna line system specifications

• Preferred BTS specification

Activities such as propagation modeling, field strength predictions and measurements are usually referred to as coverage planning.

Coverage predictions

The possibilities for rough coverage calculations based on propagation curves formulas. These average values are not enough for the detailed network planning; therefore many computer-aided tools based on digital maps usage have been developed to improve the quality of the predictions.

Propagation models

Propagation models are essentially curve fitting exercises. Propagation tests are conducted at different frequencies, antenna heights, and locations over different periods and distances. The receive signal data is analyzed using mathematical tools and are fitted to an appropriate curve. Formula to match these curve are then generated and used as models. Some of the major propagation models are:

- Long-distance propagation model
- Longley-Rice model (irregular terrain model)
- Okumara
- Hata
- Cost 231-Hata (similar to Hata: for 1500-2000 MHz band)
- Wolfish-Ikegami Cost 231
- Wolfish-Xia JTC
- XLOS (Motorola proprietary model)
- Bullington
- Du Path loss model
- Diffracting Screens model

Point to point and cell coverage

Using a given digital map it is not difficult to obtain the path profile between any two points, say BS and MS. Furthermore the profile can be related to the corresponding area types, thus making possible the calculation of specific propagation loss. Normally different corrections, such as the diffraction loss or mixed land-sea path correction are added to the basic propagation loss. the result of such point to point calculations can be used for cell coverage prediction

Field strength measurements

The field strength measurements are needed for determination of coverage areas as well as for tuning the propagation model of network planning system. In case of measurement before base station installation the site should equipped with the test transmitter. Possible test transmitter configurations are mobile station base station channel unit signal generator with power amplifier. The selection of routs to be measured depends on the purpose of the

measurements. The most critical routs are typical located in urban or hilly areas. Where it is difficult to predict the field strength values with high accuracy.
During the field strength measurement, the measuring system normally takes the samples from the signal received by the antenna. The field strength samples recorded by a control computer with time, location marks. Using the samples it is possible to calculate the average values.

File Formats:

The required Digital MAP support the following format:-

Radio Propagation Software Formats	***Raster Formats***	***Vector Formats***
A955 (Alcatel)	Windows Bitmap (.BMP)	Arc/Info Generate (.AGE)
Asset (Aircom)	Generic Band Sequential (.BSQ)	Microstation Design (.DGN)
Atoll (Forsk)	Intergraph Raster (.COT)	USGS Digital Line Graph (.DLG)
CelPlanner (CelPlan)	USGS DEM (.DEM)	AutoCAD DXF 14 (.DXF)
ICS Telecom (ATDI)	NIMA DTED (.DTD)	Arc/Info Import/Export (.E00)
NetPlan (Motorola)	Arc/Info Import/Export (.E00)	MapInfo Data Interchange Format (.MIF/MID)
Odyssey (Andrew)	ER Mapper Compressed Raster (.ECW)	ESRI Shapefile (.SHP)
Pathloss (Contract Telecom Engineering)	ER Mapper Raster (.ERS)	MapInfo Table (.TAB)
Mentum Ellipse (Mentum)	ESRI ASCII GRID (.ASC, .GRD)	OGC/Google KML (.KML)
Mentum Planet (Mentum)	Vertical Mapper GRID (.GRD)	
NetAct (NSN)	Arc/Info binary GRID (.FLT)	
NIR (Hexagon)	Erdas Imagine Image (.IMG)	
TEMS Cell Planner (Mentum)	JPEG JFIF, ESRI World file (.JPG, .JPW)	
SignalPro (EDX)	JPEG 2000, ESRI World file (.JP2, .JPW)	
Sirenet (SGT)	ENVI Image Format(.HDR)	
WaveSight (Wavecall)	MapInfo GRID (.MIG)	
W-Card (NEC)	PCIDSK (.PIX)	
Wizard (Optimi/Ericsson)	Generic binary (.RAW)	
and more	TIFF 6.0, GeoTIFF, ESRI World file (.TIF, .TFW)	
	ASCII XYZ (.XYZ)	