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Radio Mobile

Software for Wireless Systems Planning

About Radio Mobile

- It is a tool for the design and simulation of wireless systems.
- Predicts the performance of a radio link.
- Uses digital maps and GIS (Geographical Information Systems) as well as any other digital map, even the ones digitized by yourself.
- It is public domain software.
- Runs on Windows 95, 98, ME, NT, 2000 and XP.
- Uses Digital terrain Elevation Model for the calculation of coverage, indicating received signal strength at various point along the path.

Terrain Profile

- Radio Mobile automatically builds a profile between two points in the digital map showing the coverage area and 1st Fresnel zone.

- Digital elevation maps (DEM) are available from several sources.

- Different antenna heights can be tried to achieve optimum performance.

Features

- Works from 20 kHz to 200 GHz.

- Checks for line of sight.

- Calculates Path loss, including losses due to obstacles.

- Creates networks of different topologies (net master/slave, PTP and PMP).

- Calculates coverage area from the base station in a point to multipoint systems.

What do you need to create a Network?

- Download Radio Mobile from internet: http://www.cplus.org/rmw/english1.html
- Where to get elevation data?
  - Free data for most of the world at 30 arc second resolution (~1km), are available at: http://edcdaac.usgs.gov/gtopo30/gtopo30.html
  - Other sources are coming up and usually reported at the Radio Mobile home page, like SRT (Shuttle Radar Topography)
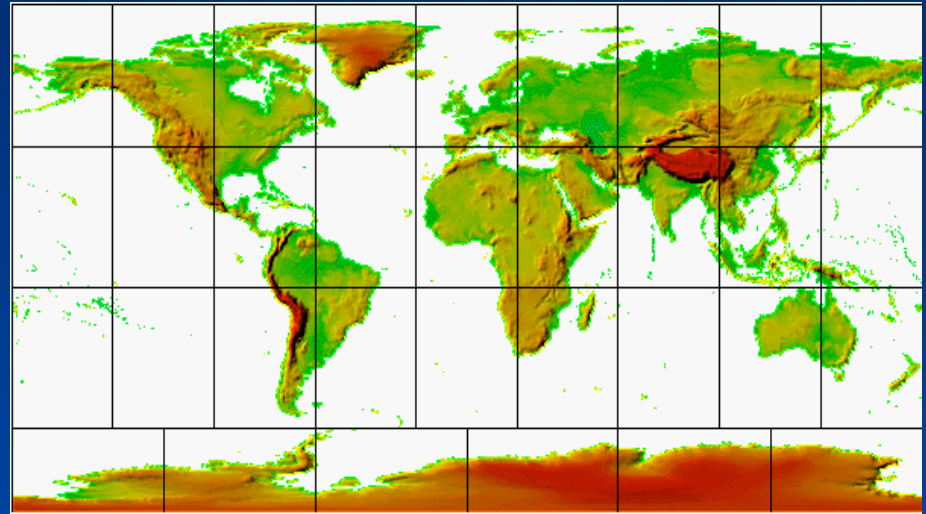
Resolution

- Resolution is expressed in arc sec (1/3600) of a degree

- At the equator, earth circumference is about 40000 km, 1 arc sec ~ 30 m

- At the pole, earth circumference is zero

- Actual east-west resolution depends of latitude, whereas north-south is constant

Free World at 3 arc second resolution (100m)

- Continents definition
- Shuttle Radar Topography Mission (SRTM) data products - Africa
- Shuttle Radar Topography Mission (SRTM) data products - Australia
- Shuttle Radar Topography Mission (SRTM) data products - Eurasia
- Shuttle Radar Topography Mission (SRTM) data products - Islands
- Shuttle Radar Topography Mission (SRTM) data products - North America
- Shuttle Radar Topography Mission (SRTM) data products - South America
- N.B. Africa, Australia and Islands 4 to be released soon.
- **Free World at 30 arc second resolution (1km)**

- Shuttle Radar Topography Mission (SRTM) data products
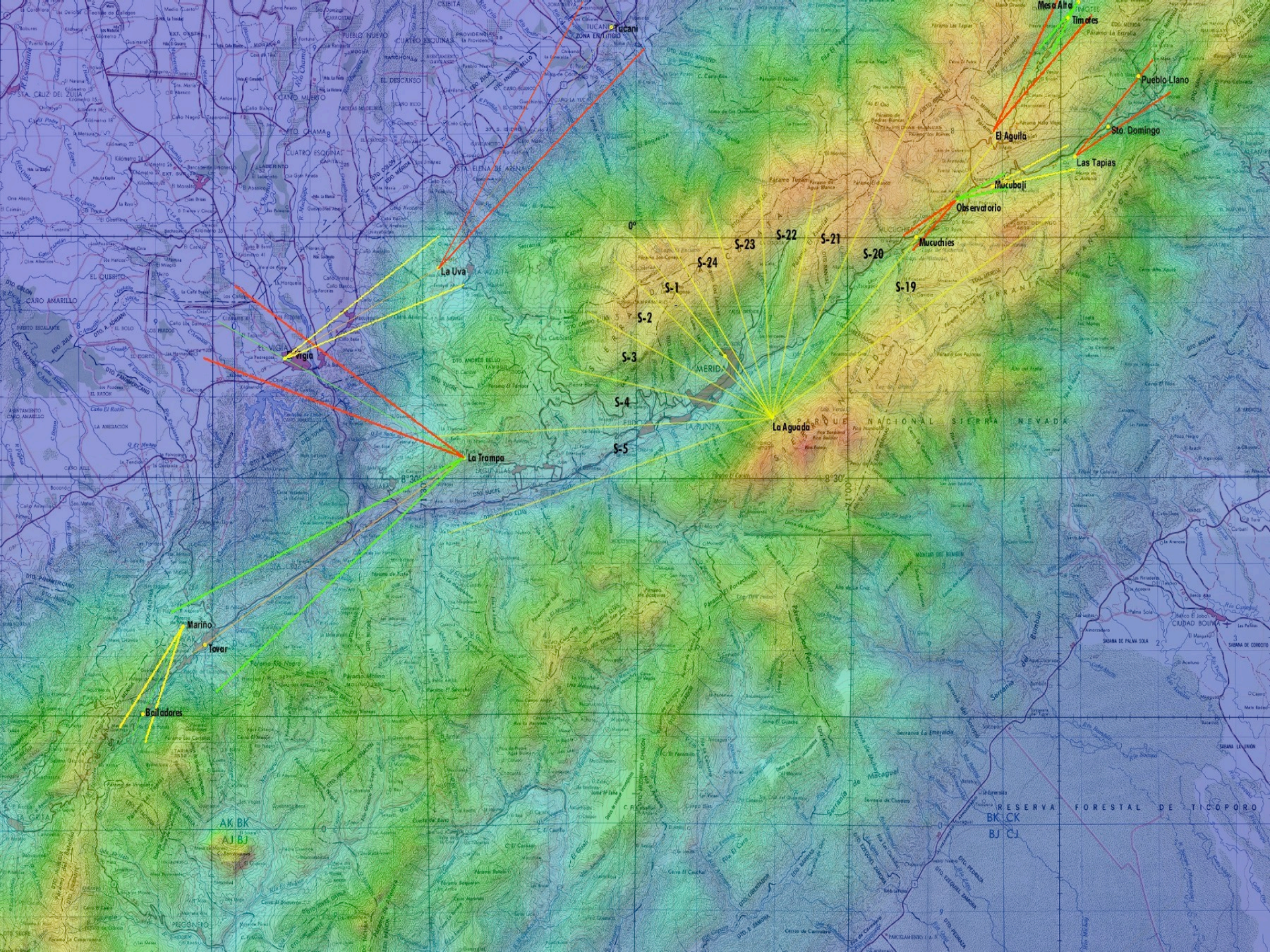- - SRTM30 (GTOPO30 format)

Pictures

- DEM do not show coastlines or other readily identifiable landmarks, but they can be combined with other kind of data in several layers to obtain a more useful and readily recognizable representation.

- You can digitize your own maps and combine them with DEM

GPS tracking

- Opens a form in order to initiate GPS position acquisition via a serial port and enter Internet addresses at which position will be reported (see How to use a local GPS and report position)

Elevation grid

- The deployment area is a rectangular zone with horizontal coordinates for the center position and a size in kilometers that should be large enough to contain all units

- Opens a small window that shows 5x5 elevation data records centered at cursor position along with cursor coordinates

Deployment area

- The deployment area is a rectangular zone with horizontal coordinates for the center position and a size in kilometers that should be large enough to contain all units

Maps

- Maps are based on a matrix of up to 2000x2000 elevation records (meters above sea level), which can be saved in a file with a .MAP extension. Map data can be viewed with the Elevation grid.

- **Terrain Elevation Data**

- Digital Terrain Elevation Data (MIL-D-89020 AMENDMENT 1).

- Maps are based on digital terrain elevation data. The program can actually access a resolution of 1, 3, or 30 seconds of an arc, which corresponds to a spacing of approximately 30m, 100m, or 1 km between records.

What do you need to create a network?

- Obtain the coordinates of your stations.
  - From Maps, GPS, or database
  - For example: Site 1 (Main Repeater Galileo 13º43'11'' E, 45º42'15''N)
- Specifications of the system:
  - Topology of the network (Point to multipoint,PP).
  - Gain of antennas and type.
  - Max Transmit power (Watt or dBm).
  - Line or guide wave loss.
  - Received power level (dBm).
  - Antennas height in meters.
  - Frequency of operation.
  - Polarization used.
  - Other parameters of radio link and radio communications.

Acquire elevation data

Step by step

- 1. In View menu, select World map. On the world map picture, click on the desired position for the map center position.

- 2. In File menu, select Map properties. This will open a form with all the necessary controls to create a map. Click on Use cursor position button.

- 3. Optionally use city or coordinates in DMS (Latitude and longitude in degree, minute, second) to enter a more precise position for the center of the map.

- 4. Select the database and associated logical drive.

- 5. Select 400x400 pixels and 100 km size.

- 6. Click on the Apply button.

- 7. If an error message occurs, verify the database drive and redo from step 2.

- 8. In File menu, select New picture (See How to create a map picture).

Radio Coverage

- **Radio link:**
  - Opens a form with a picture box that shows earth profile, radio performance, and observation features between each pair of units (see Radio link and system performance).
- **Visual coverage:**
  - Opens a form in order to initiate visual coverage drawing on a map picture (see How to perform visual coverage).
- **Radio coverage:**
  - Opens a form in order to initiate radio coverage drawing on a map picture (see How to perform radio coverage).