UNIVERSIDAD ICESI

Radio Frequency Spectrum Management Workshop

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Spectrum Monitoring Network Design in Americas

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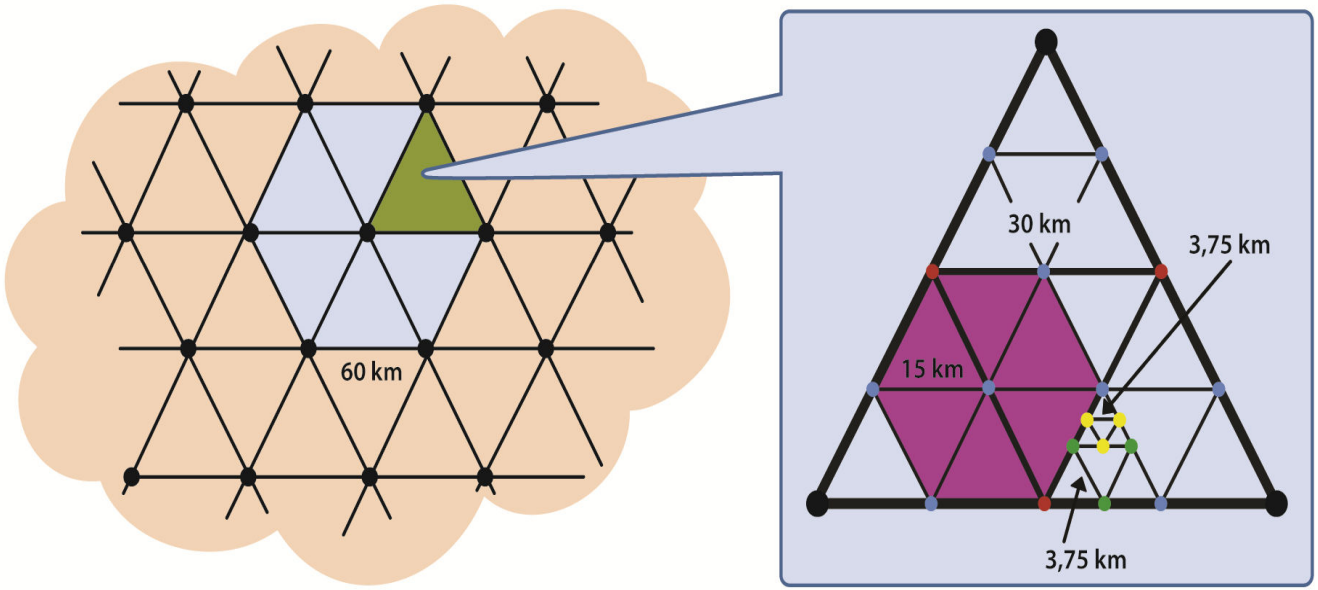
The ITU Monitoring Handbook

MONITORING NETWORKS DESIGN

ITU Monitoring Handbook

- The planning of a monitoring station is based on the work of Pavliuk et al.[3],[4] and [5], and is based on the calculation of coverage zones with reference to the two tasks for which spectrum monitoring is typically used. Most of the coverage calculations are based on ITU Report ITU-R BS.944. This work suggests a blanket approach for the estimation of the area covered by a monitoring station. Kogan and Pavliuk also recommend the use of the ITU-R P.1546 recommendation for propagation model.

ITU Model



vnsh.ws/11

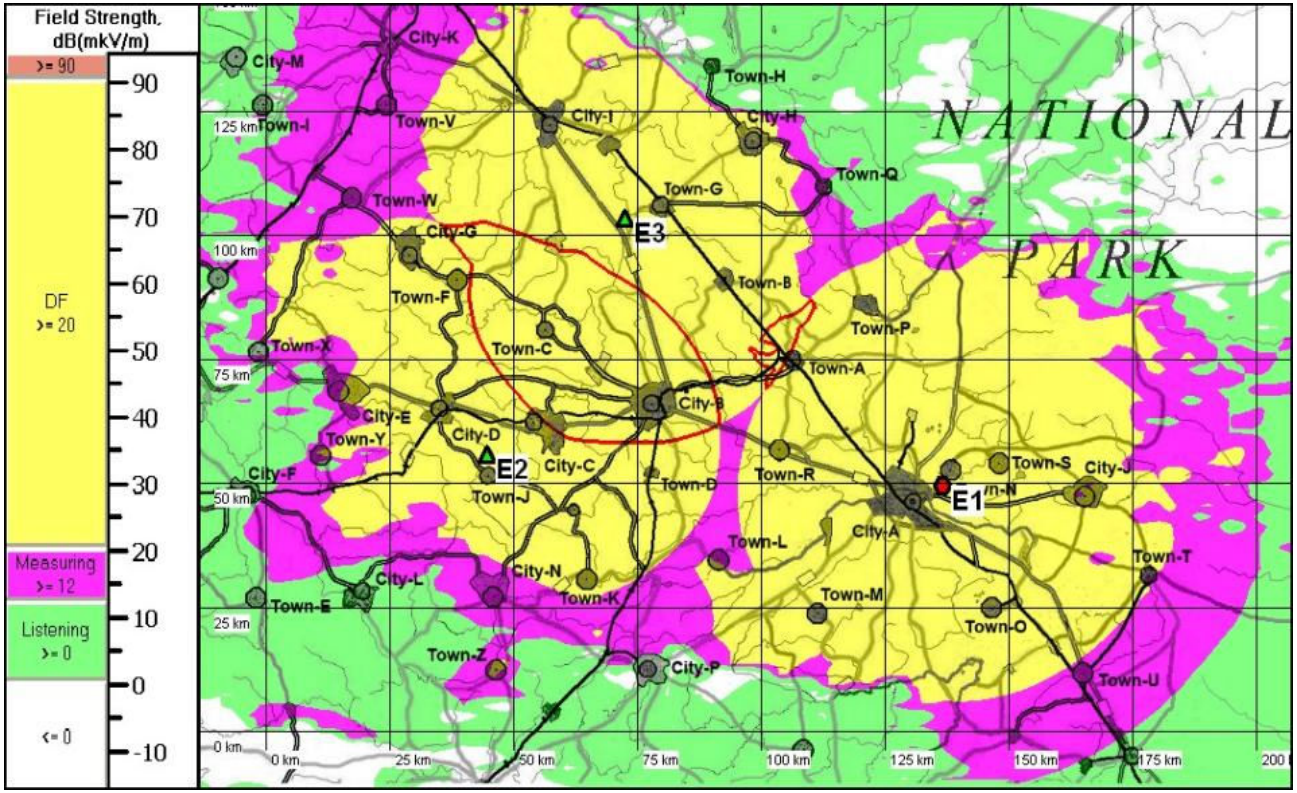
ITU-R Report SM.2356-2015

PROCEDURES FOR PLANNING AND OPTIMIZATION OF SPECTRUM-MONITORING NETWORKS IN THE VHF/UHF FREQUENCY RANGE

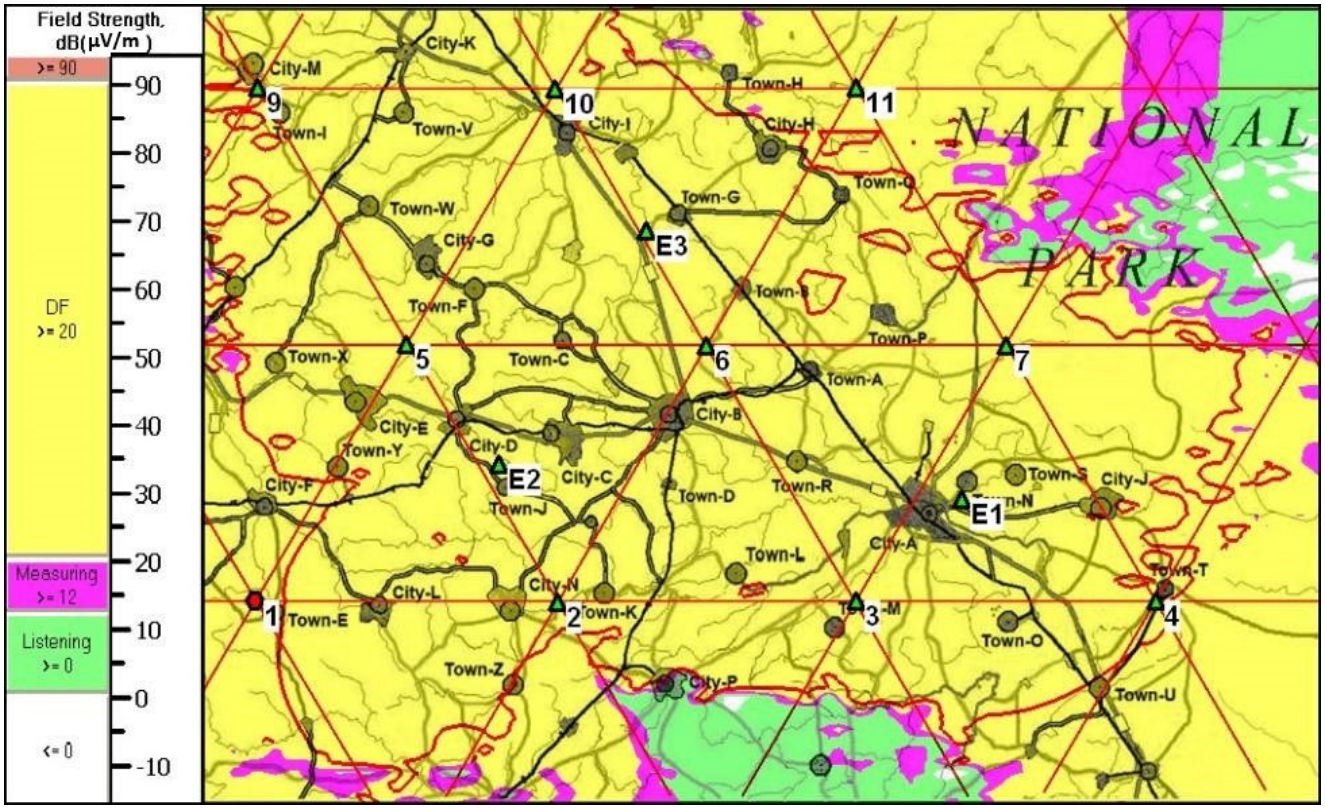
Coverage of Monitoring Stations

- The coverage zones of the existing stations are calculated for different monitoring functions with the aid of computer software with at least the features described in Chapter 5 of the ITU Handbook on Computer-Aided Techniques for Spectrum Management (2015 edition).

Overall monitoring coverage zones of the three existing stations

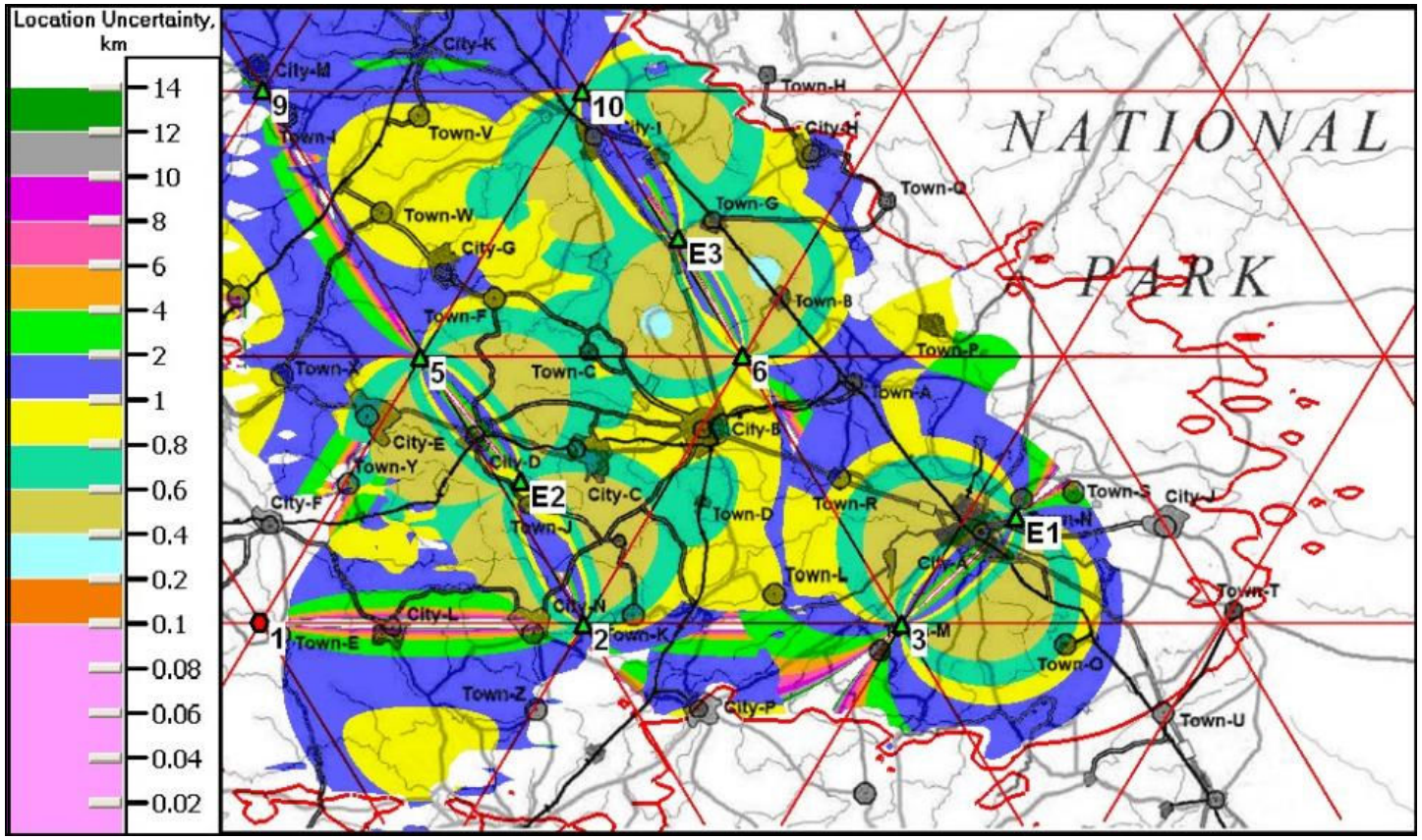


Coverage of Monitoring Stations



11 stations, regular grid, category II transmitters (power 10 W, antenna height 20 m)

Coverage of DF Stations

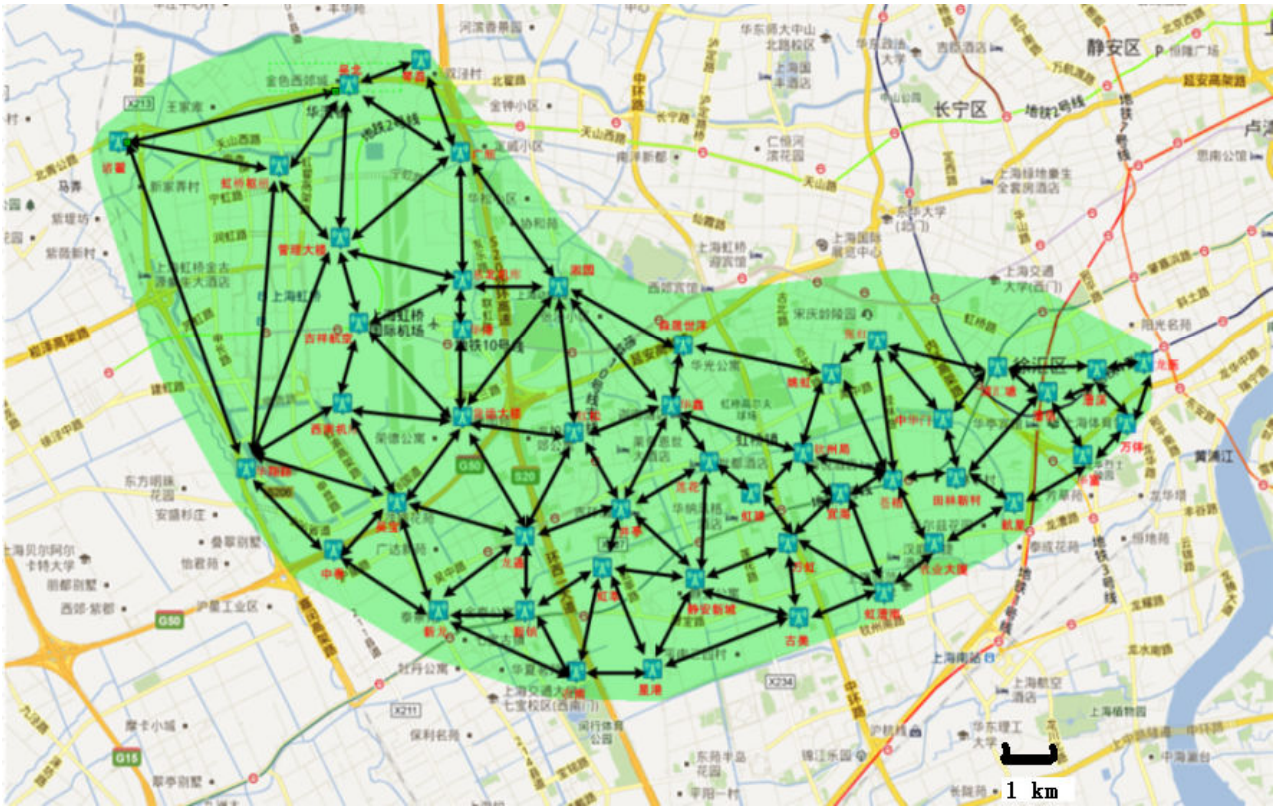


Location coverage without stations 4, 7 and 11

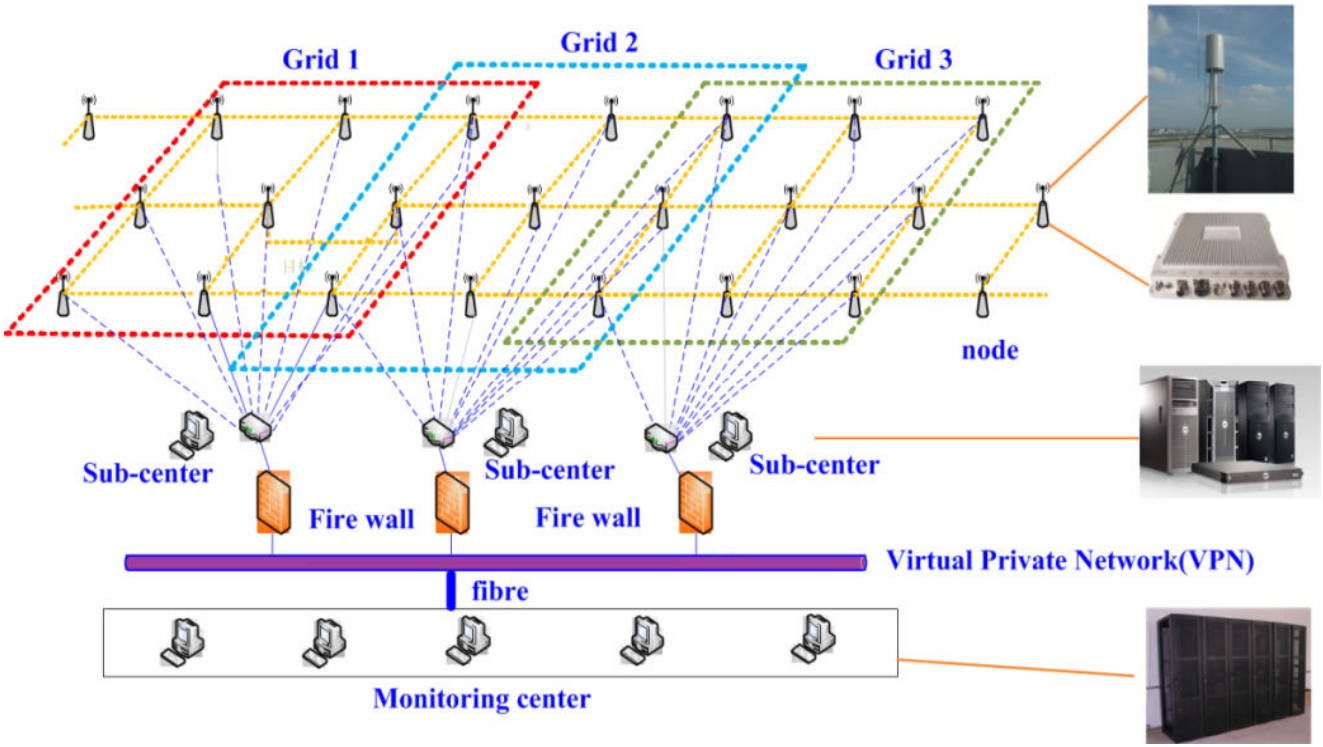
ITU-R Report SM.2355-2015

SPECTRUM MONITORING EVOLUTION

Grid Monitoring (ITU-R Report SM.2355- 2015)



Architecture of Grid Monitoring



LATIN AMERICA SITUATION

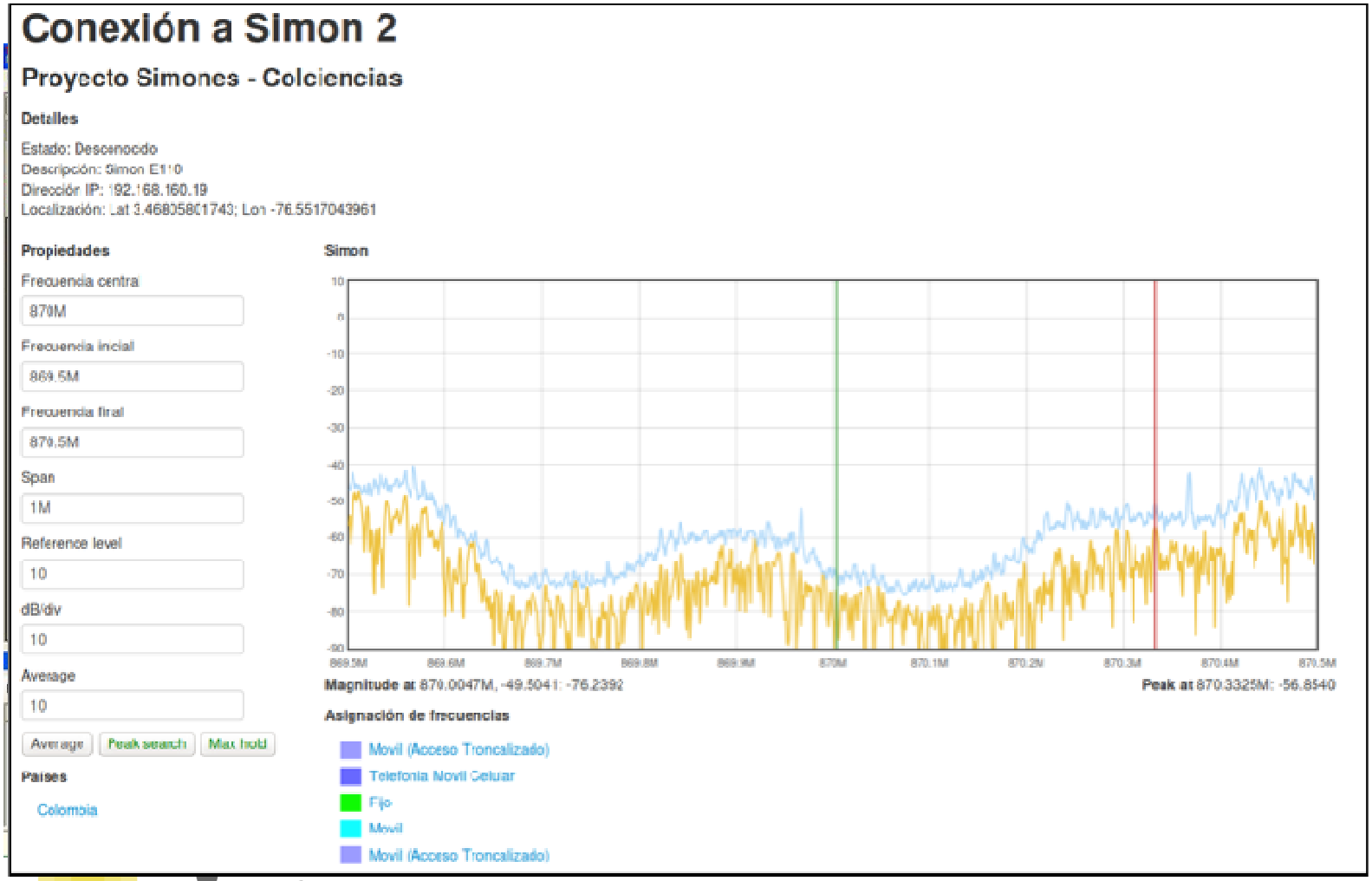
Monitoring in Developed Countries

- NTIA develops its own monitoring system with home made software.
- Most manufacturers develop specific equipment according to NTIA requirements.
- Same situation occurs with the German BNETZA or the British OFCOM.

Monitoring in Latin American Countries

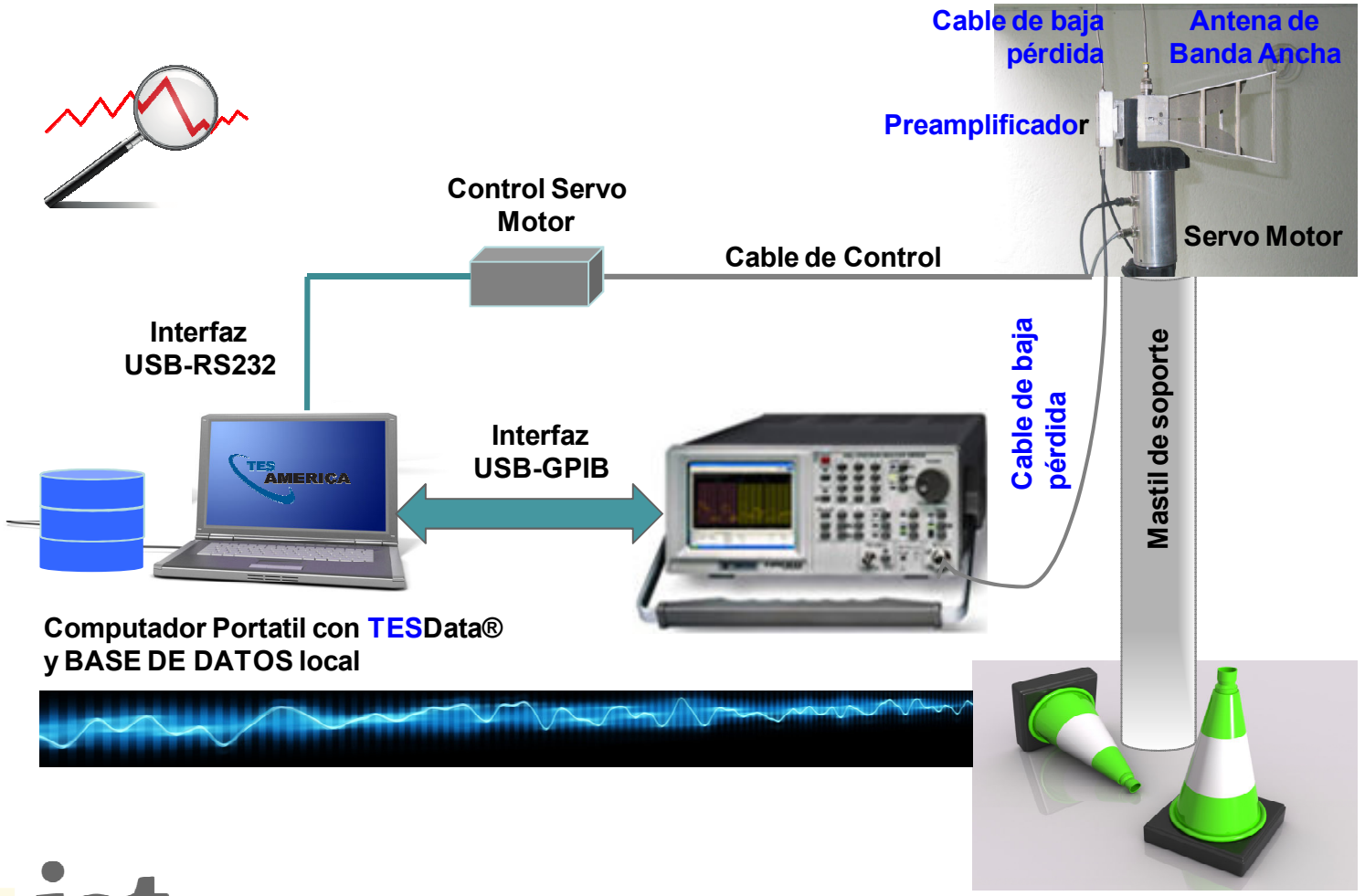
- Monitoring networks specifications are based on ITU recommendations.
- ITU recommendations are manufacturers driven.
- There are important budget constraints.
- Most of the monitoring tasks are related with Broadcasting systems.
- Simpler systems can be used.

Monitoring system based on SDR

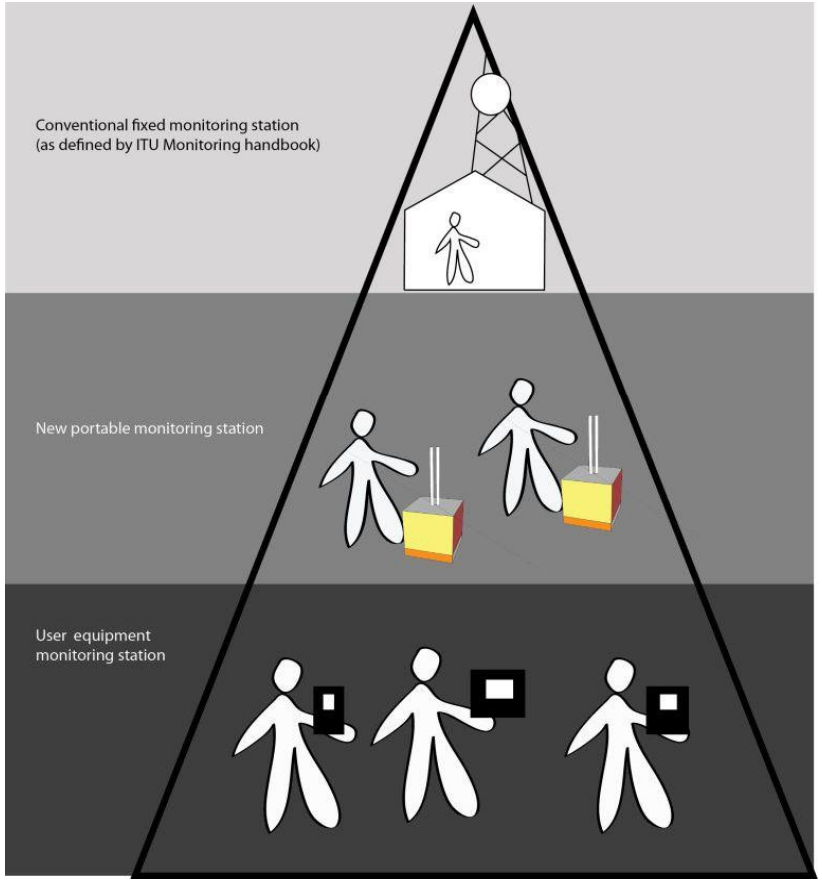


Monitoring System based on Spectrum Analyzer and software

Monitoring System based on Spectrum Analyzer and software

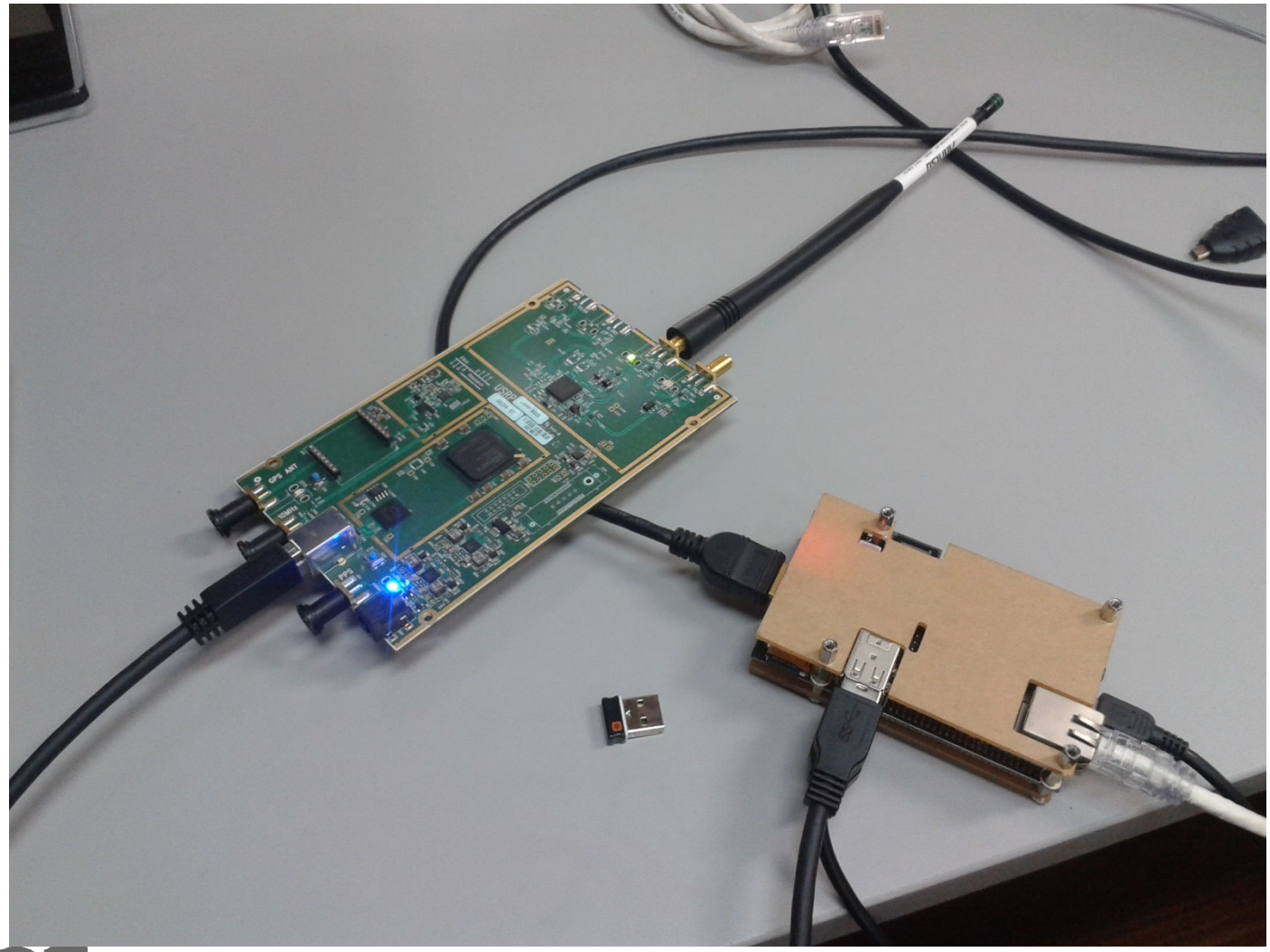


Spectrum Monitoring Hierarchy



Proposed hierarchy for Monitoring evolution

SIMONES



Economic Tradeoff

PLANNING AND OPTIMIZATION OF SPECTRUM-MONITORING NETWORKS WITH FOCUS ON SPECTRUM USERS

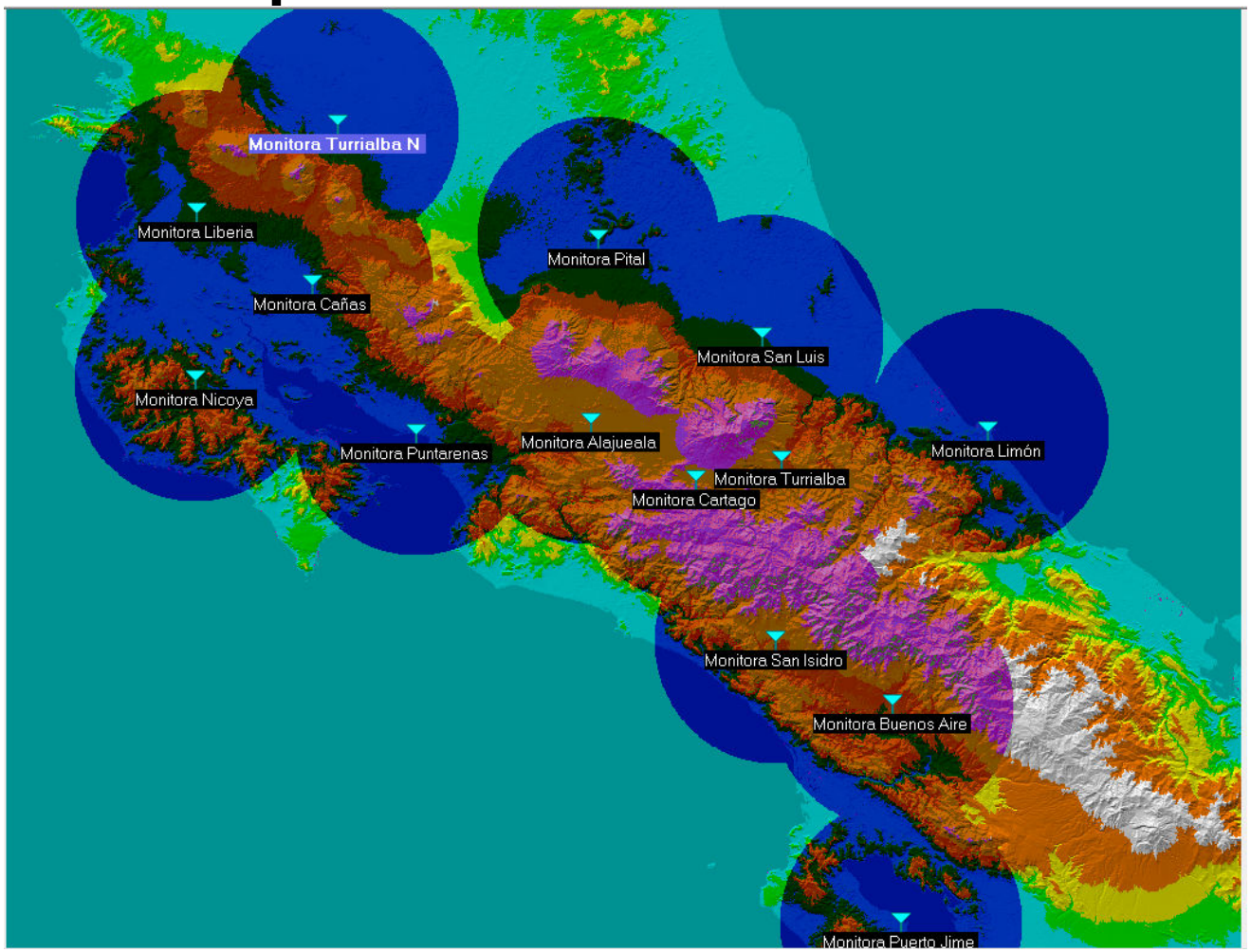
Monitoring Networks with User consideration

- In order to improve the economic efficiency of monitoring networks, we propose to include population data in design considerations.
- The priority is population coverage and not geographical coverage.
- In this way, broadcasting service areas are prioritized.
- Besides, we use semi deterministic propagation models to improve coverage simulation results.

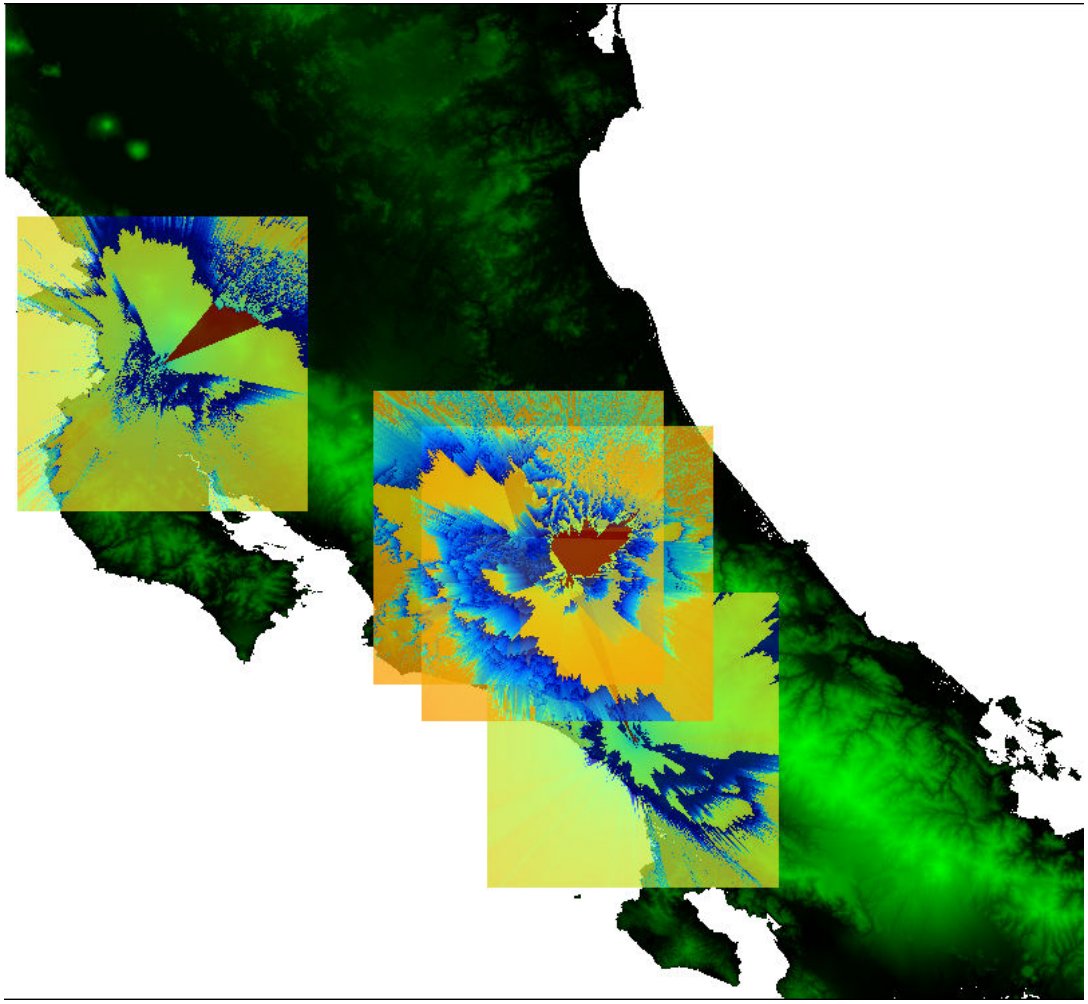
Monitoring Networks with User consideration

- In the next slides we will show two examples of spectrum monitoring networks planned with this criteria.
- We can see the reduction of the number of fixed monitoring stations.
- And therefore the cost of the system.
- Not covered geographical areas are attended with mobile or transportable stations.

Proposed Modification



Proposed Modification



Costa Rica Monitoring System

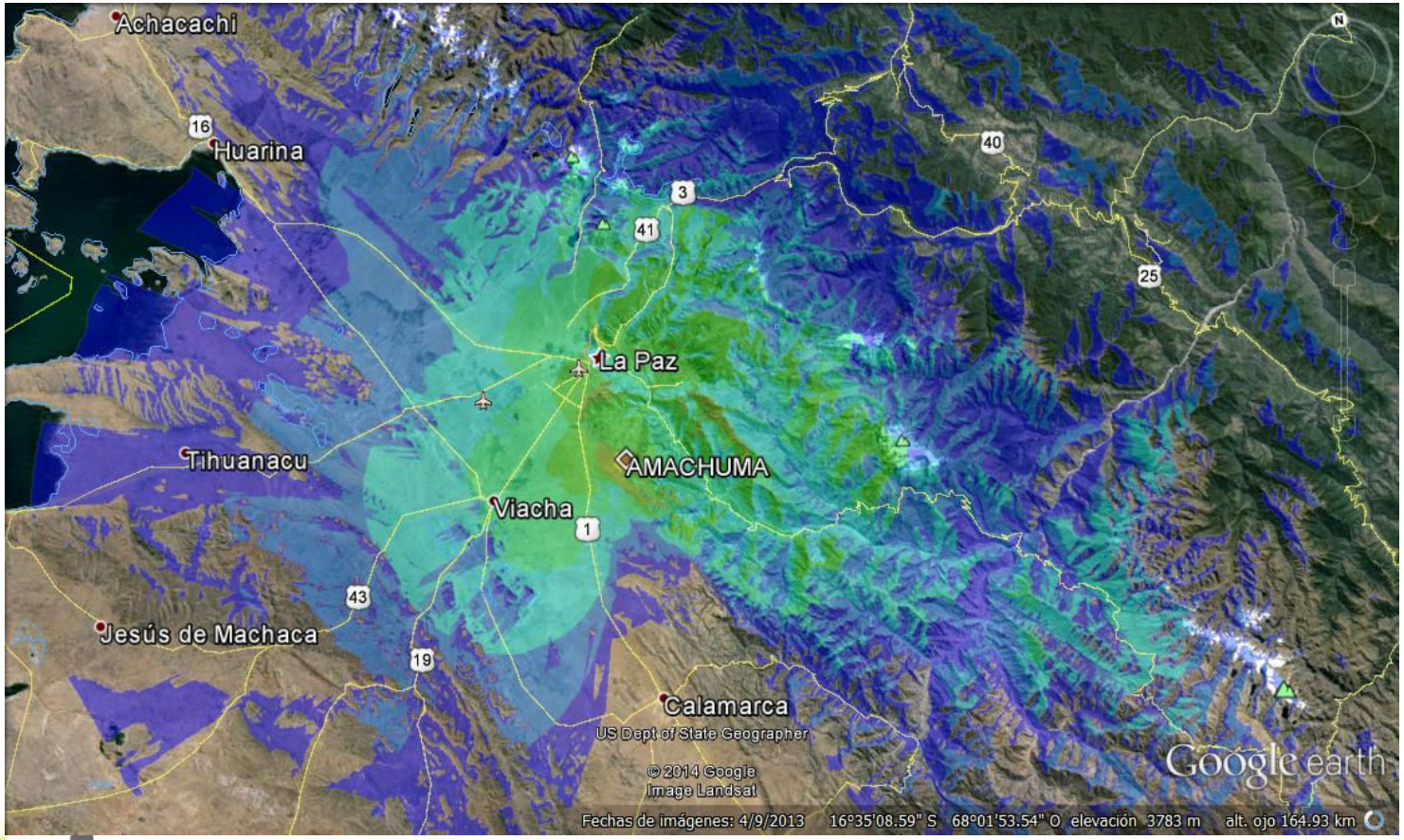
Costa Rica Monitoring System

Monitora	Cantón	%	Población	%	Cobertura Km2	%
Heredia	37	46,3%	2.166.058	57,1%	1.967	3,8%
Cartago	6	7,5%	349.839	9,2%	1.525	3,0%
San Isidro	2	2,5%	162.326	4,3%	4.312	8,4%
Liberia	5	6,3%	148.977	3,9%	5.130	10,0%
Red Fijas	50	62,5%	2.827.200	74,5%	12.934	25,3%

Costa Rica Monitoring System

Proposed Modification - Bolivia

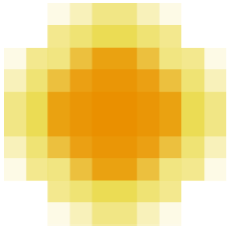
Proposed Modification



Proposed Modification

Departamento	Monitora		Población	%
La Paz	Amachuma		2.706.351	27
	Pampahasi		-	
Cochabamba	Los Alamos		1.758.143	17,5
Tarija	Morros Blancos		482.196	4,8
Santa Cruz	Hamacas		2.665.084	26,6
	Pampa de la Cruz			
Bolivia			10.027.254	**75,9**

THANK YOU



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