Open and regionalized spectrum repositories for emerging countries

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The convenience of wireless networks in terms of mobility and ease of deployment has made them extremely popular. These networks convey data in the order of couple of exa-bytes per month and, during the next five years, this number is expected to grow at least in one order of magnitude[1]. A natural consequence of this tendency is a congested wireless spectrum in the band for cellular communications as well as free ISM band, thus creating the so-called spectrum crunch.

In order to keep track of primary users and incumbents of the wireless spectrum, regulators in emerging countries use manual and static databases. However, there are intermittent legal users (e.g., UHF microphones), unaccounted legal users, and rogue users that utilize the spectrum with no control, being potential interferers. This is a clear opportunity for regulators and local authorities to promote regionalized and centralized repositories for keeping track of the used and unused frequencies, boosting a more efficient use of the spectrum. Moreover, this is a promising way of tackling the spectrum crunch, i.e., through an appropriate assessment of the spectrum usage.

A central repository will allow people and governments to cooperate, paving the way to alternative wireless network deployments bringing Internet connection, specially needed in emerging regions. Successful examples of such networks operating in the free spectrum are: GuifiNet, entirely built by independent organizations or, long distance TV White Spaces deployments in the UHF band in Africa. Upon this success stories along with an appropriate use of the spectrum, interested parties should also incentivize the creation of community wireless service providers, better placed to understand the local people's needs. Thus performing a better content delivery and an adequate support for local production of content and services.

Recent wireless technologies such as TV White Spaces can be deployed if there is enough information about unoccupied portions of the spectrum. TVWS networks can be deployed in rural and remote areas more easily because they are meant to overcome long distances. However, a successful deployment depends on the availability of spectrum, but measuring these dynamics has always been an expensive task. The cost of spectrum analyzers is in the order of thousand of dollars and the processing of information generated by these devices is not oriented towards understanding the available frequencies of interest (or white spaces) within a geographical region.

To understand the current occupation of UHF and ISM band, we have developed open low-cost systems for capturing and processing spectrum dynamics in extensive areas. We pretend to motivate people to be aware of the local occupation of their spectrum, and thus we have also developed www.zebra-rfo.org: a web system with collaboration capabilities as in social networks, able of organizing long measurement campaigns in order to visualize the occupation of the spectrum. Zebra-RFO also offers the possibility of editing measurement campaigns in order to isolate different areas of interest (i.e., rural, urban, sub urban), and also conveniently represent the rough occupation of large portions of the spectrum in UHF band and ISM band, both of high interest in the process of bringing the next billion people online.

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[1] Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update 2014–2019 White Paper