

A distributed spectrum monitoring system

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Overview

1. WHAT does *DUAL-USE* mean?
2. WHAT is a *SMS* (Spectrum Monitoring System)?
3. WHICH *SDR* platform is used?
4. HOW the system works?
5. WHICH sensing algorithms are employed?

Section I : DUAL – USE meaning

Dual-use products, services and technologies can address the needs of both defense and civil communities. A large and increasing number of technologies are generic and not specific to single civil or military applications.*

Dual-use technology transfer is the ability to adapt a technology developed in one sector (defense or civil) for use in the other (civil or defense).*

*EU funding for *dual use* - Guide for Regions and SMEs, European Commission, October 2014

Section II: WHAT is a SMS (Spectrum Monitoring System)?

- It can be configured as a support system for cognitive radio devices for continuous evaluation of spectral opportunity.

- Features:
 - fast sensing times;
 - tunable accuracy;
 - wide frequency range;
 - fast network connection;
 - wide geographical area coverage;
 - security;
 - cost-effective system.

Section III: WHICH SDR platform is used?

Instrument specifications:

Processing unit:

ARM Cortex A9, 667 MHz clock frequency, dual core;

FPGA unit: Xilinx 7 Series;

RAM: 1GB DDR3 for ARM, 512 MB DDR3 for FPGA logic;

RF features:

frequency range 70 MHz – 6 GHz,

up to 56 MHz of instantaneous bandwidth;

2 RX, 2 TX chains

Filter banks

Peripherals:

10/100/1000 BASE-T Ethernet,

GPS receiver,

USB support.

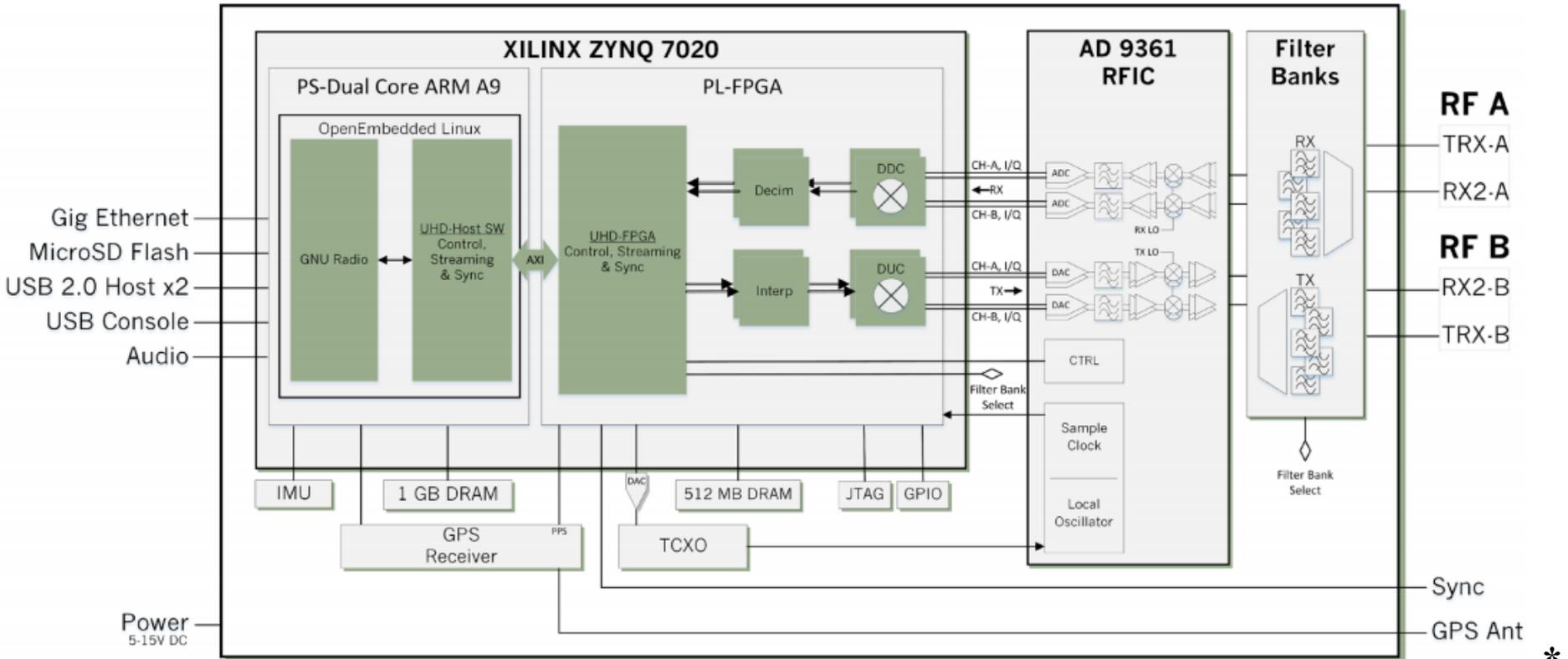


ETTUS E310 SDR*

*https://www.ettus.com/content/files/USRP_E310_Datasheet.pdf

Section III: WHICH SDR platform is used?

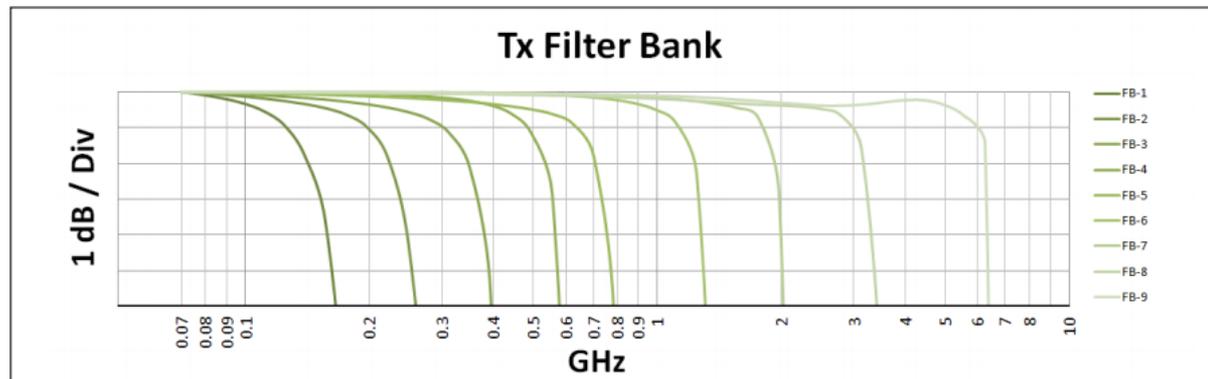
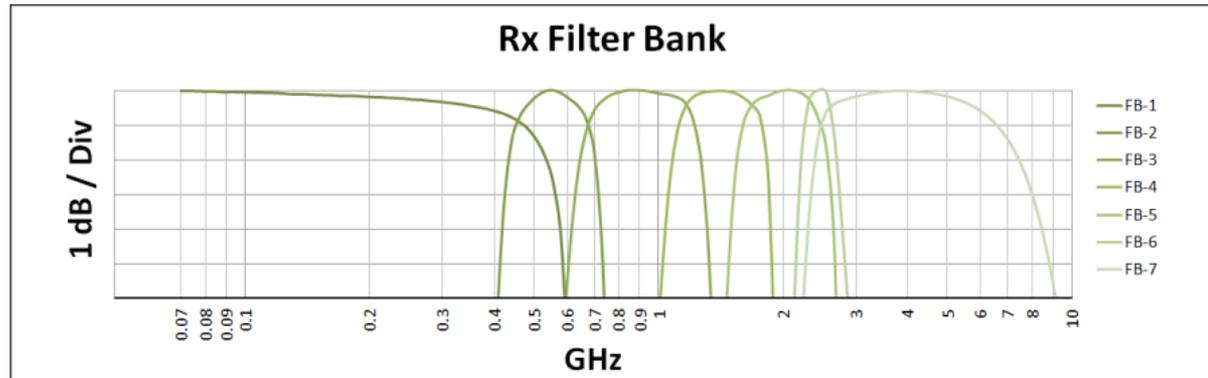
Part 2: block diagram



*https://www.ettus.com/content/files/USRP_E310_Datasheet.pdf

Section III: WHICH SDR platform is used?

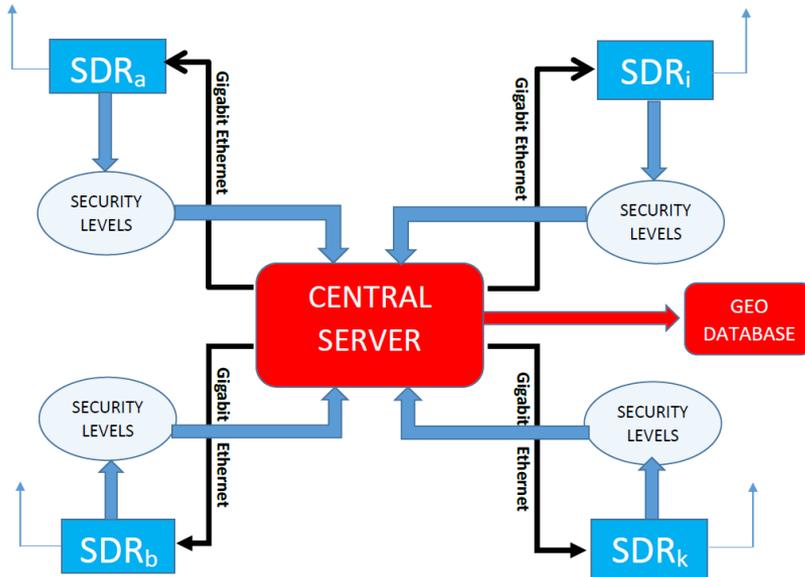
Part 3: filter bank response



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*https://www.ettus.com/content/files/USRP_E310_Datasheet.pdf

Section IV: HOW the system works?



In **phase 2**, SDRs perform sensing according to the received parameters and additional information consisting of time-stamp, task execution time and GPS coordinates is provided together with occupancy data.

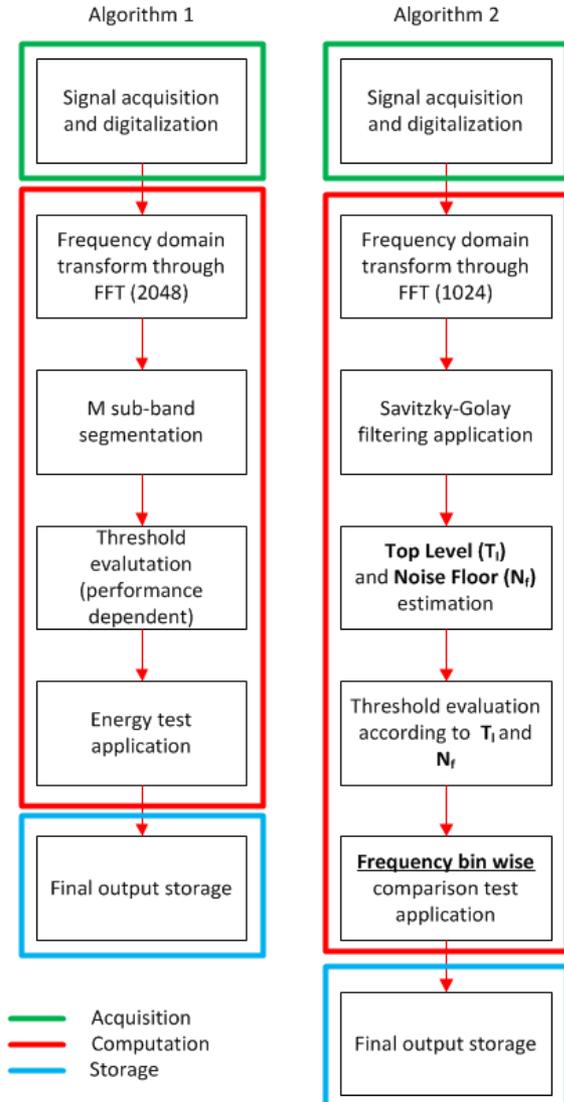
Three phases:

1. Initialization;
2. Sensing stage;
3. Data collection and storage.

In **phase 1**, the central server initializes the sensing devices with the features of the sensing phase: frequency interval, performance and time constraints, final user of the sensing (civil or military).

In **phase 3**, data are cyphered with different cryptoschemes, depending on the sensing final user. In particular, AES 256 and 3-DES cryptoschemes are adopted in military and civil case, respectively. Then, the cyphered data are sent to the central server, results are evaluated and proper information is transferred to the geolocation database.

Section V: WHICH sensing algorithms are employed?



employed?

Algorithm 1 is employed for military purposes:

- Very fast computation
- Very high frequency resolution
- Algorithm is tunable to obtain pre-determined sensing performance.

Algorithm 2 is employed for civil purposes:

- Heavier computation;
- Poorer resolution in FFT but bin-based detection;
- Filtering stage