Realizace vlastní BTS stanice postavené na OpenBTS

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Requirements

- Computer
- USRP (Universal Software Radio Peripheral) Price 2300 $
- Daughterboard
- Antenna
- Mobile phone
- SIM cards
- Software
  - Linux
  - Gnu Radio
  - SIP PBX (Asterisk, Yate, Freeswitch)
  - OpenBTS Public release - under AGPLv3 lic.
Scheme

- **USRP RFX900/1800**
- **RF/IF**
- **AD**
- **FPGA**
  - up-/down-sampling
  - data rate conversion
  - timing
- **GNU Radio**
  - OpenBTS
    - demod
    - GSM-stack
    - timing
- **PC**
- **Asterisk**
- **UE**
The USRP N210 architecture includes Xilinx Spartan 3A-DSP 3400 FPGA kit. In combination with WBX 50-2200 MHz Rx/Tx Daughterboard provides adequate architecture for creating cell phone base station or other applications. There is UHD (USRP Hardware Driver), which provides API and drivers to the host computer for communication with USRP device. OpenBTS software is written in the C++ programming language and ensures the following functions of Um radio interface, which provides radio interface for GSM standard. [7,8] GMSK modulation with 13/48 MHz modulation rate and 200 kHz distance – supports GSM850, PGSM900, DCS1800 and PCS1900.

Multiplexing and coding
Management of network resources
Daughterboard WBX

- 50-2200 MHz Rx/Tx
- Up to 100 mW output power
- Noise figure of 5 dB
- Independent receive and transmit chains, but synchronized for MIMO operations
- land-mobile communications, maritime and aviation band
- radios; cell phone base stations, PCS and GSM multi-band transceiver covering 6 amateur bands; broadcast TV; white spaces
Daughterboard SBX

- 400-4400 MHz Rx/Tx
- p to 100 mW output power
- Noise figure of 5 dB
- Independent receive and transmit chains,
  but synchronized for MIMO operations
- WiFi, WiMax, S-band transceivers and 2.4 GHz ISM band transceivers
Databases

- the OpenBTS database. By default in /etc/OpenBTS/OpenBTS.db
- the SIP authorization and registration database. By default in /etc/OpenBTS/sipauthserve.db
- the smqueue database. By default in /etc/OpenBTS/smqueue.db
Routing calls

Asterisk PBX is implemented inside the OpenBTS project and provides mobility management, authentication of the user and routing of the calls between registered users. Registered modems are identified by IMSI number of SIM card presented in the modems.
IMSI

- International Mobile Subscriber Identity
- MCC (3) cz 230
- MNC (2)
  - 01 T-Mobile
  - 02 O2
  - 03 Vodafone
  - 04 MobilKom (U:Fon)
  - 99 Testovací ČVUT FEL
- MSIN
  - 230011234567890 T-Mobile
- OpenBTS MCC = 001 MNC = 01
Services

- N210 default IP: 192.168.10.2
- Expected port assignments (etc/OpenBTS.db)
- 5060 Asterisk SIP interface
- 5061 Local SIP softphone
- 5062 OpenBTS SIP interface
- 5063 smqeue SIP interface
- 5064 subscriber registry SIP interface
- 5700 transceiver interface
OpenBTS Speech Quality

![Graph showing MOS values against Distance for 1 call, 2 calls, and 3 calls.](image.png)
Thank you for an attention.