# Realizace vlastní BTS stanice postavené na OpenBTS

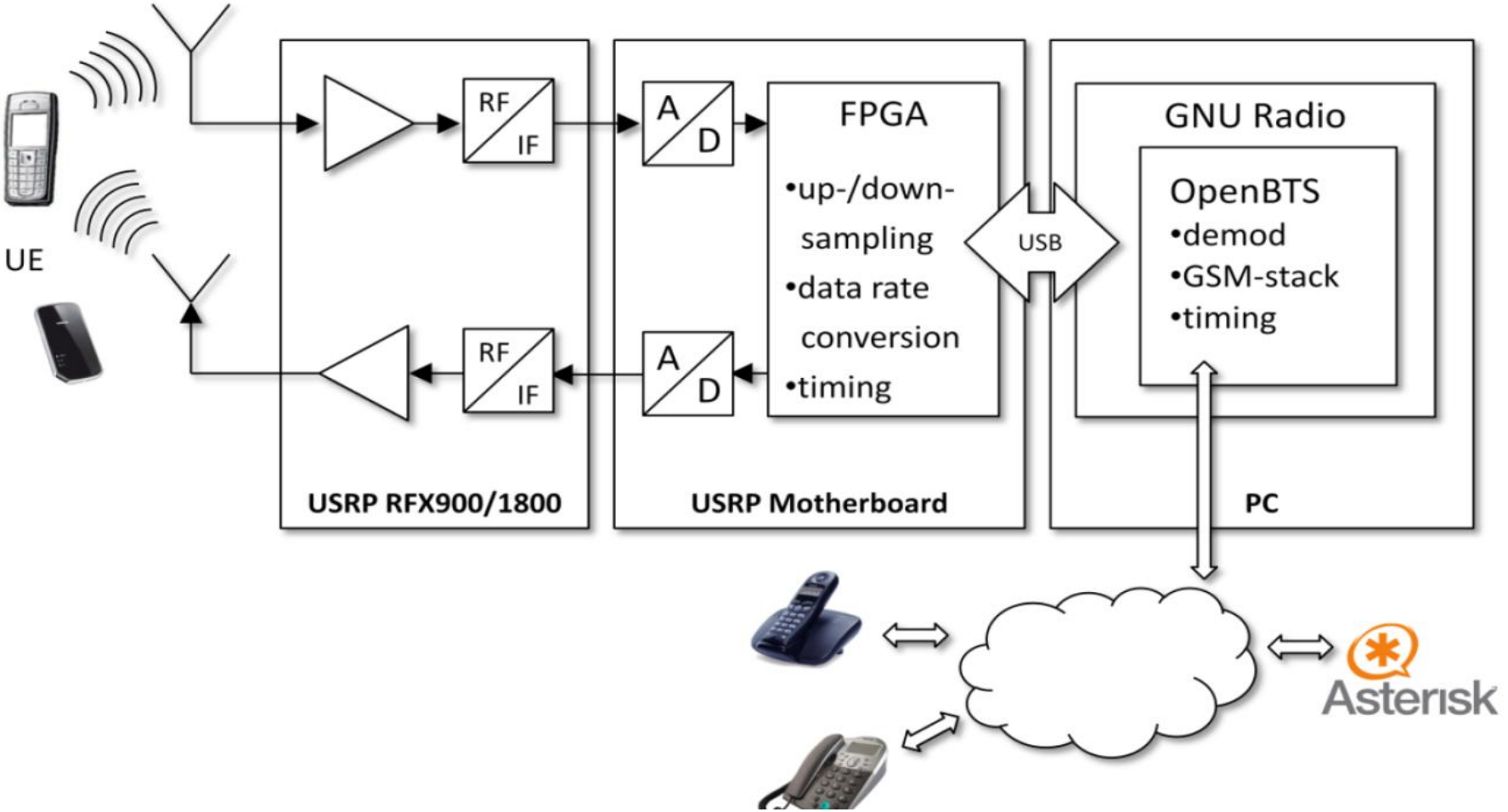
Ing. Martin Mikulec

Department of Telecommunications

# 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


UE
RF
IF
A
D
FPGA
•up-/down-
sampling
•data rate
conversion
•timing
USB
GNU Radio
OpenBTS
•demod
•GSM-stack
•timing
USRP RFX900/1800
USRP Motherboard
PC
Asterisk

# USRP N210

# USRP N210

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

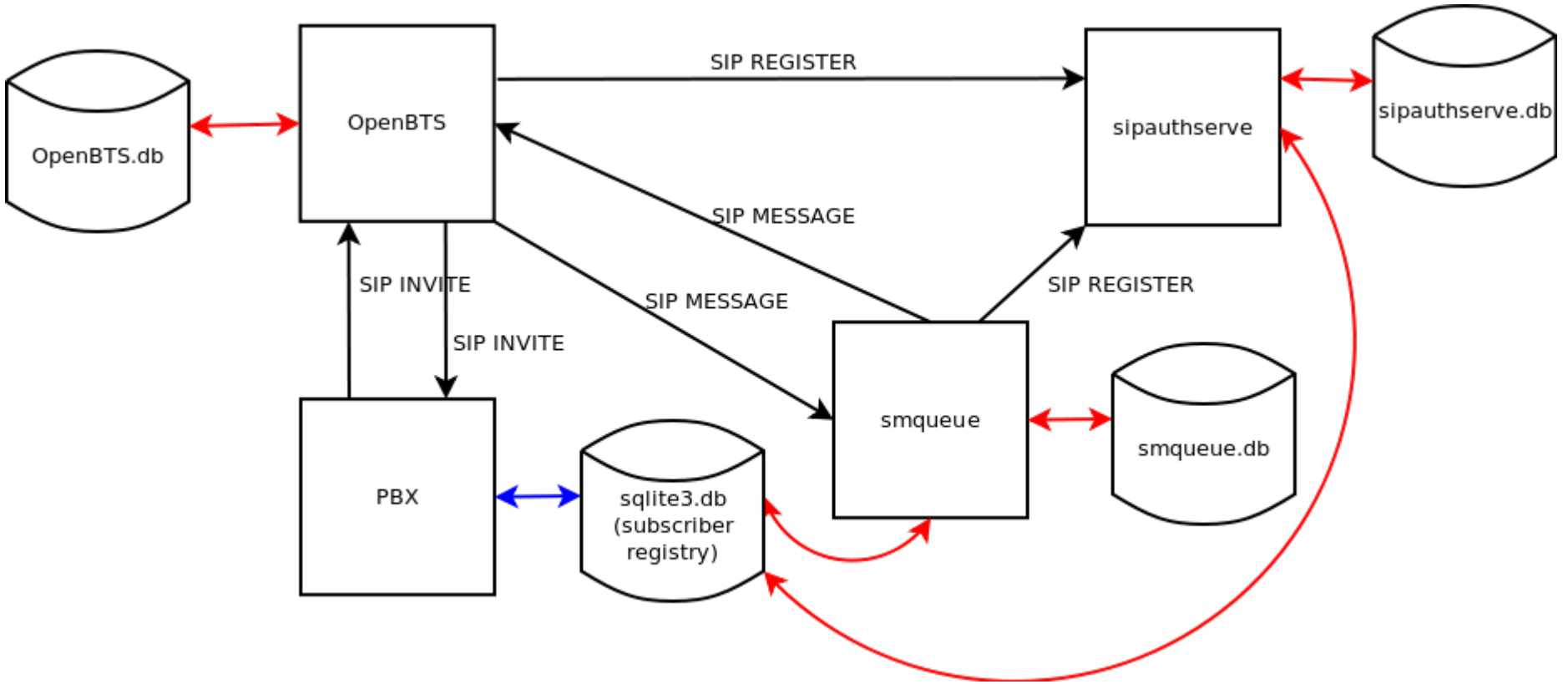
# Daughterboard WBX

- 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

# Scheme


OpenBTS.db
OpenBTS
SIP REGISTER
sipauthserve
sipauthserve.db
SIP MESSAGE
SIP INVITE
SIP MESSAGE
SIP REGISTER
SIP INVITE
smqueue
smqueue.db
PBX
sqlite3.db
(subscriber
registry)

# 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
- the PBX database. By default in /var/lib/asterisk/sqlite3dir/sqlite3.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.

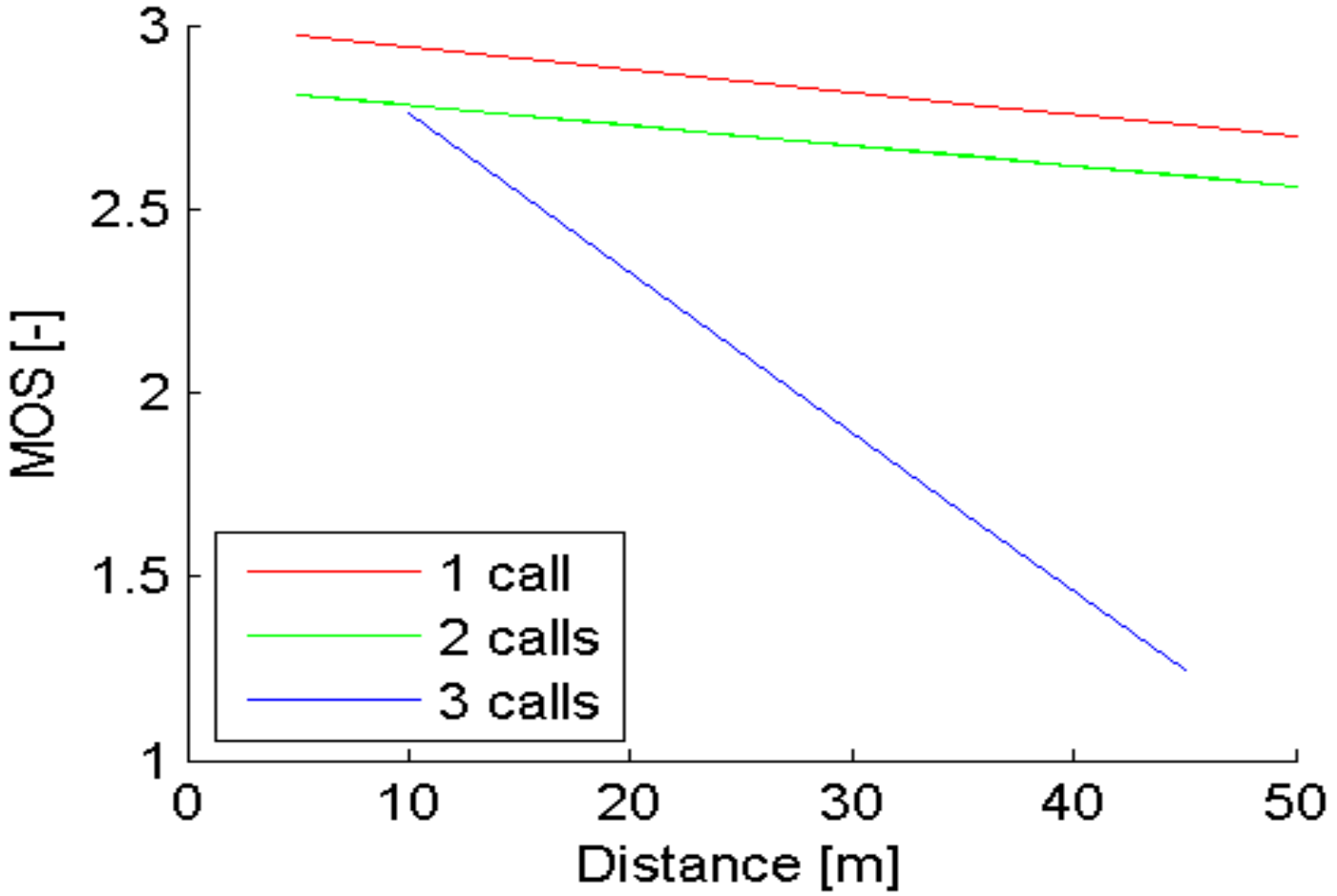
# IMSI

- 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 assigments (etc/OpenBTS.db)
- 5060 Asterisk SIP interface
- 5061 Local SIP softphone
- 5062 OpenBTS SIP interface
- 5063 smqeue SIP interface
- 5064 subscriber registry SIP interfac
- 5700 transceiver interface

# OpenBTS Speech Quality



Thank you for an attention.