

# Implizite Situationserkennung

SEP Sommersemester 2010

2. März 2010

---



**Stephan Sigg**

TU Braunschweig

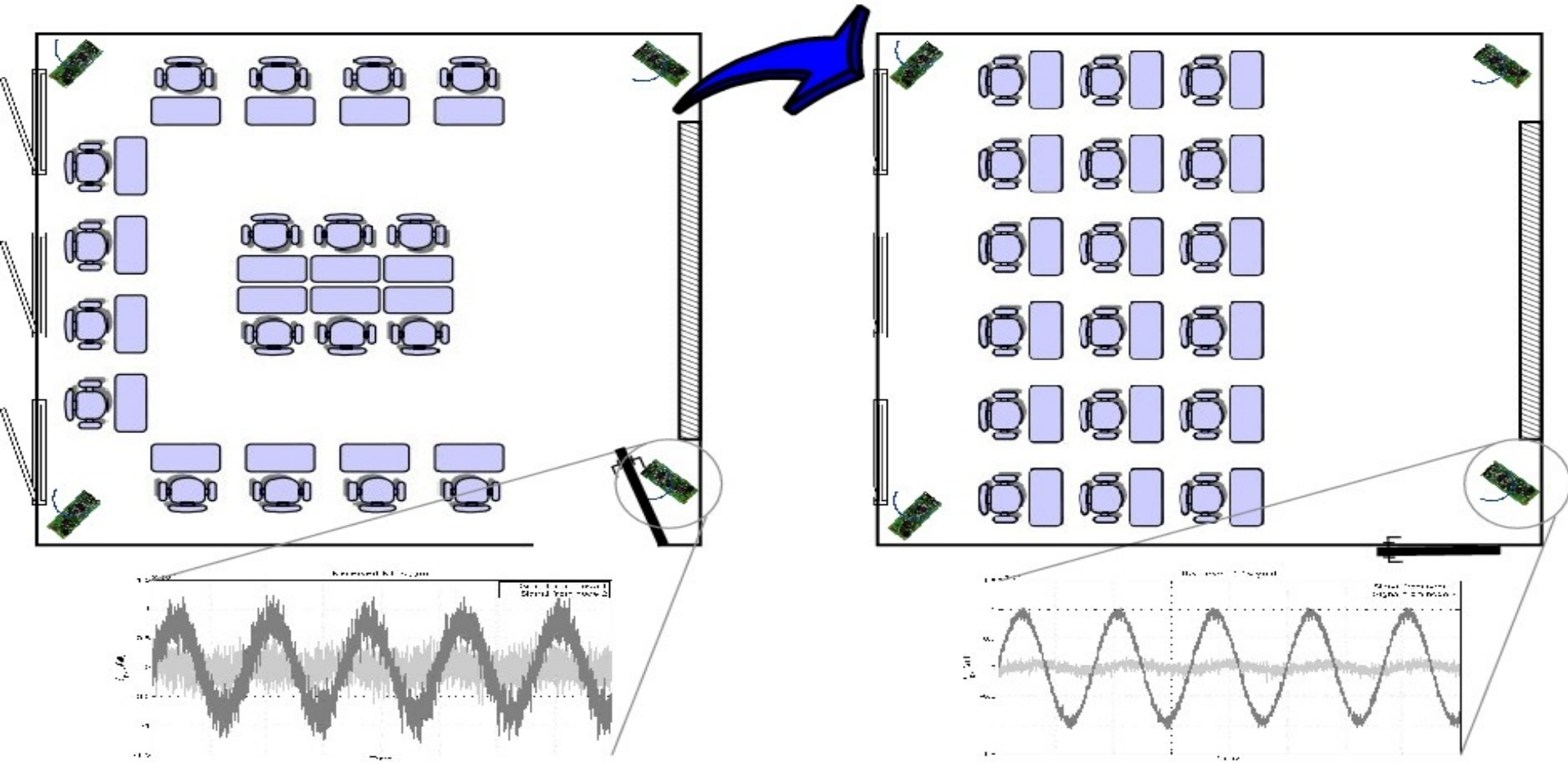
Institute of Operating Systems  
and Computer Networks

[www.ibr.cs.tu-bs.de/dus](http://www.ibr.cs.tu-bs.de/dus)

# Implicit situation awareness

## Project focus

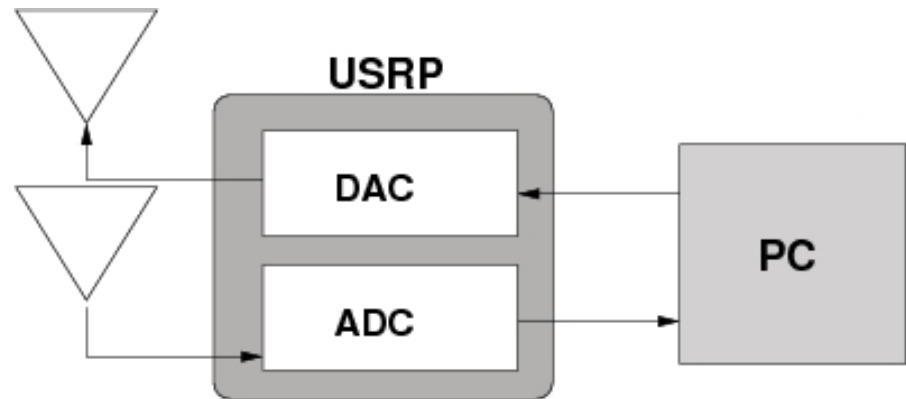
- Develop application for **sensing** situations based on **link quality** between distributed wireless nodes



# USRP software radios

## The Universal Software Radio Peripheral (USRP)

- Communication interface controlled by standard PC
- USB connected



- Hardware:
  - Altera Cyclone FPGA
  - Four A/D converter (12 Bits/sample), sample rate 64 MegaSamples/sec
  - Daughterboards for various transmit/receive frequencies

# GNU Radio Companion

## Workbench to create signal processing flow graphs

- Preconfigured signal processing blocks available
  - Signal sources/sinks
  - Modulation schemes
  - Software scope
  - Filters
- Blocks dragged to workspace

The screenshot displays the GNU Radio Companion (GRC) interface. The main workspace shows a flow graph with the following blocks and connections:

- File Source** (File: file\_source.txt, Repeat: Yes) connects to **Packet Encoder** (Samples/Symbol: 2, Bits/Symbol: 1, Access Code: Pad for USRP: Yes, Payload Length: 8).
- Packet Encoder** connects to **GMSK Mod** (Samples/Symbol: 2, BT: 350m).
- GMSK Mod** connects to **Multiply Const** (Constant: 16.384k).
- Multiply Const** connects to **USRP Sink** (Unit Number: 0, Interpolation: 400, Frequency (Hz): 902M, Gain (dB): 0, Side: A, Transmit: Auto T/R).
- USRP Source** (Unit Number: 0, Decimation: 200, Frequency (Hz): 27M, Gain (dB): 20, Side: A, RX Antenna: RXA) connects to **Keep 1 in N** (N: 10).
- Keep 1 in N** connects to **Complex to Real**.
- Complex to Real** connects to **Scope Sink** (Title: Scope Plot, Sample Rate: 32k, V Scale: 0, T Scale: 1m).
- Variable Slider** (Label: Multiplier USRP, Default Value: 16.384k, Minimum: 0, Maximum: 32.767k, Converter: Float) connects to **Moving Average** (Length: 1k, Scale: 1, Max Iter: 4k).
- Moving Average** connects to **Variable Sink** (Variable: root\_mean\_square, Decimation: 1).
- Variable Sink** connects to **USRP Sink**.

The **Scope Plot** window shows a blue sine wave signal. The plot has a grid and is labeled "Scope Plot". The signal is plotted on a grid with a peak-to-peak amplitude of approximately 1.0 and a period of approximately 10 samples. The plot is titled "Scope Plot" and has a label "Ch1" on the right side. The plot is displayed in a window titled "untitled".

The **Blocks** panel on the right side of the interface lists the following categories:

- [ Sources ]
- [ Sinks ]
- [ Graphical Sinks ]
- [ Operators ]
- [ Type Conversions ]
- [ Stream Conversions ]
- [ Misc Conversions ]
- [ Synchronizers ]
- [ Level Controls ]
- [ Filters ]
- [ Modulators ]
- [ Error Correction ]
- [ Line Coding ]
- [ Probes ]
- [ USRP ]
- [ Variables ]
- [ Misc ]

The **Variable Slider** window shows the following settings:

- Multiplier USRP: 16.384k
- Volume: 1

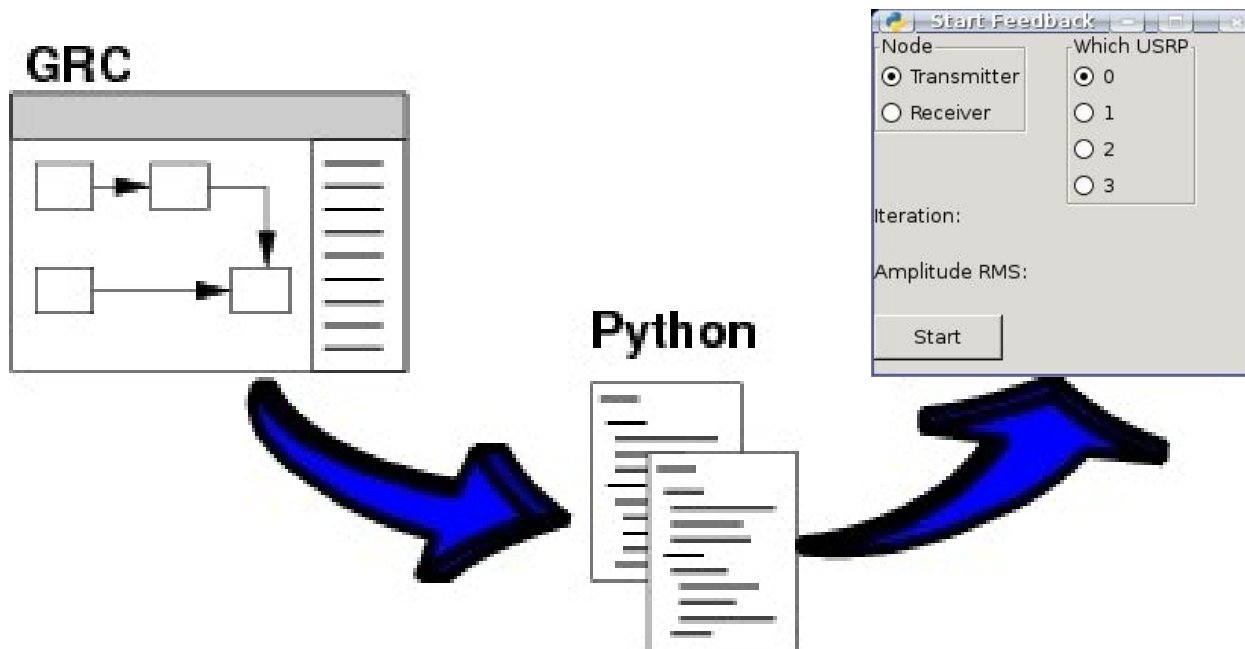
The **Scope Plot** window shows the following settings:

- Ch1
- Auto
- 50%
- Run/Stop
- Fmt: line
- X:t

# Python

## Python code from the GRC

- GRC creates python code from signal-flow-graphs
- Further program logic added in Python



# Questions?

---



**Thank you for your attention.**