



SAAB RDS
TECHNOLOGY ENABLER

SDR Training

www.saabrds.com

USRP Software Defined Radios Training Course

Dive into the cutting-edge world of software-defined radio (SDR) with SAAB RDS's comprehensive training course. Over three days, participants will gain hands-on experience with USRP hardware, explore UHD and GNU Radio, and delve into advanced topics such as RFNoC, spectrum monitoring, and 5G/NR system implementation. Whether you're configuring hardware, debugging technical problems, or implementing a stereo FM transmitter, this course offers a deep dive into SDR's capabilities. Ideal for engineers and enthusiasts alike, join us to unlock new possibilities in radio technology.



Detailed Training Schedule

Day 1:

- Introduction to SDR, USRP hardware architecture, UHD, GNU Radio.
- Set up and configure customer hands-on hardware, and installation of software onto the laptop's & computers.
- Tutorial for UHD and GNU Radio.
- Using the UHD device driver utility programs and example programs.
- Programming the USRP from C++ using the UHD API.
- Using GNU Radio with the USRP.
- Creating and running flowgraphs from both GRC and Python.
- Managing USRP FPGA images.
- Verifying the Operation of the USRP Using UHD and GNU Radio.
- About USRP Bandwidths and Sampling Rates.
- About packetized I/Q data, CHDR packets, and using Wireshark to view IQ data.
- Debugging and triaging common USRP technical problems (network configuration, flow-control errors, RF issues).
- Demo and hands-on exercises of using UHD utility programs and GNU Radio.
- Demo and hands-on exercises of spectrum monitoring and recording and transmitting signals over-the-air.
- Demo and hands-on exercises of implementing a stereo FM transmitter and receiver.

Day 2:

- Continued Tutorial for UHD and GNU Radio.
- Installing, using, and demo of the GQRX software.
- Installing, using, and demo of several GNU Radio Out-of-Tree (OOT) modules.
- Installing, using, and demo of spectrum-painting tool. - Host computer performance tuning.
- High-rate streaming with 10 and 100 Gbps Ethernet. - Using DPDK with UHD for high-rate streaming.
- Continued Tutorial for UHD and GNU Radio.
- Using the OctoClock and OctoClock-G.
- Synchronization and MIMO Capability with USRP Devices.
- Synchronizing USRP Events Using Timed Commands in UHD.
- Phase-coherent operation of USRP devices.
- The Multichannel RF Reference Architecture.
- LO Distribution on the USRP N320/N321.
- Direction-Finding (DoA) with the USRP X310 and TwinRX.
- Discussion of using UHD and GNU Radio on Single-Board Computers (SBC) such as Raspberry Pi.

Day 3:

- Introduction to the RFNoC Framework. - Demo of RFNoC Fospor.
- Set up and configure customer hands-on hardware, and installation of software onto laptops.
- Tutorial for the RFNoC Framework.
- Creating an RFNoC block from scratch and using the rfnocmodtool utility.
- Integrating a custom RFNoC block into UHD and into GNU Radio.
- Discussion of the RFNoC Replay Block.
- Discussion of RFNoC channelization.
- Tutorial for USRP Open-Source 5G/NR System Implementation (both gNB and UE sides).
- Discussion of operation in FR1, FR2, FR3 bands.
- Discussion of OpenAirInterface (OAI) and srsRAN. - Using OAIBOX for 5G USRP system solutions.

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