Open Source Software Defined Radio

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Outline

- Software Defined Radio
  - Digital Signal Processing
- HP SDR
- GNU Radio
- OSSIE
- Questions
Introduction to Digital Signal Processing

\[ y = \int x \, dx \]

\[ y_{\text{new}} = y_{\text{old}} + x; \]
Digital Signal Processing

- Use mathematical operations to replace analog hardware
- Operate on sampled data, not continuous signals

Processing Hardware
- General Purpose Processors (GPP)
- Digital Signal Processor (DSP)
- FPGA
- ASIC's (Not reconfigurable)
Software Defined Radio

- Real implementation is far more complex
Open Source SDR

- Many projects
  - HPSDR – hardware centric
    - Focused toward amateur radio
    - http://hpsdr.org/
  - GNU Radio – PC centric
    - http://gnuradio.org/trac
    - Created the USRP
  - OSSIE
    - based on Software Communication Architecture
    - http://ossie.mprg.org
High Performance SDR

- Strong Amateur Radio focus
- Modular hardware
- Specialized hardware
  - FPGA and DSP
- Under development
  - Some boards complete
Derived from the MIT Spectrumware project
  - Vanu is also related to Spectrumware

- Signal processing in C, configuration in python
- Developed the Universal Software Radio Peripheral (USRP)
USRP

- 4 A/D
- 4 D/A
- FPGA
- USB
- Daughterboards
- About 850 USD
  - With RF board
OSSIE

- Open Source SCA Implementation Embedded
- Based on Software Communication Architecture
  - Originally designed by US DOD
  - Some commercial interest
- Object Management Group is working on a standard based on the SCA
OSSIE continued

- Written in C++
  - Current development focused on Linux
  - Should work on other UNIX based OS'
- Uses OmniORB (CORBA) and XERCES(XML)
- First released in July 2004
- Development team composed of VT students
  - Graduate and under graduate students
- Project web page http://ossie.mprg.org
How did I end up here?

- OSSIE primarily runs on PC's
- My work involves SDR on small systems
- Open Embedded can build OSSIE
  - OMAP Starter Kit (OSK)
    - ARM + DSP
  - EFIKA
    - Power PC
Questions

- Outside
- Hacker room
- Bar