

Spectrum Detector for Cognitive Radios

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Description

Frequency scanner

- Used in cognitive radios
- Using Software Radio as hardware design component
- Using Software Communications Architecture to define the frequency scanner in software

Related Work

- Wireless Communication Lab has been designing and improving cognitive radio design for many years.
- Has not yet used Software Communication Architecture for cognitive radios

Designed VS Purchased

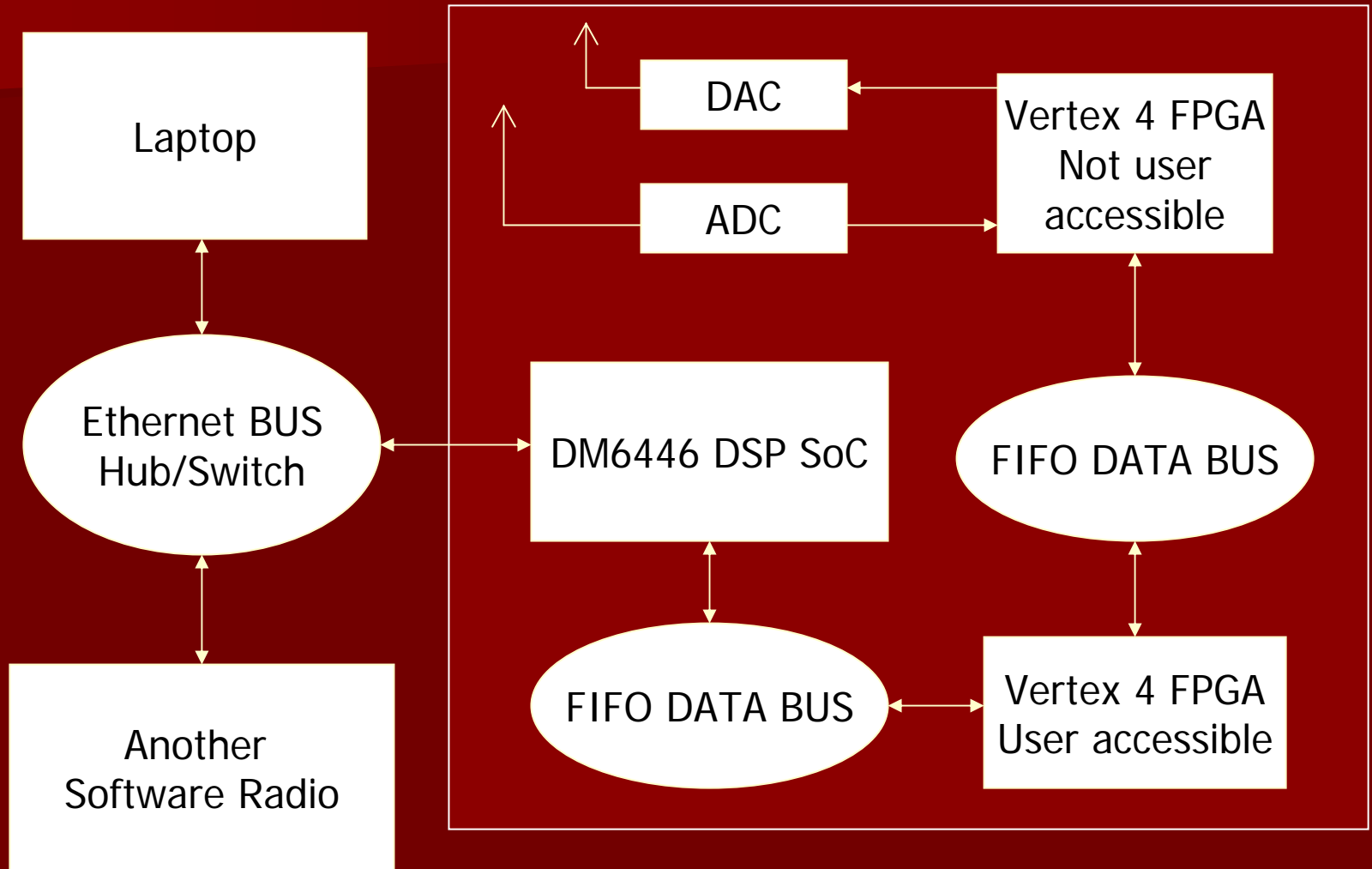
- Designed
 - Frequency scanner and display interface
- Purchased
 - Software radio provided by the Wireless Communication Lab

Hardware

There are three hardware components

- Software Radio for implementing the frequency scanner, the TMDSSFFSDR from Texas Instruments will be used
- Laptop Computer for displaying and controlling the Software Radio
- If more than one Software Radio is going to be used (one to receive and one to broadcast) then they will all need to be networked to the laptop with a switch or hub.

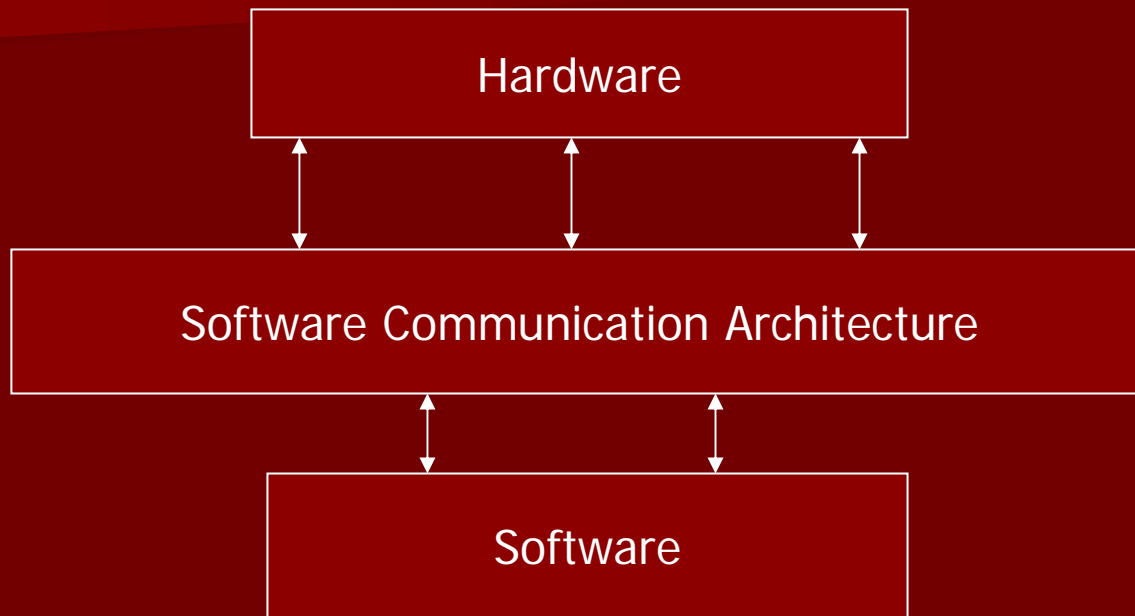
Software Radio



Software

- Software radio design using software communication architecture (SCA).
 - SCA needs to be learned in detail.
 - SCA needs to be implemented on the software radio.
 - Will only design SCA modules needed for this project
- Design of display interface
 - Software will need to be written to display the data from the frequency scanner on a computer.

Software Communication Architecture



Software Communication Architecture creates an abstraction layer between the hardware and the software of any software radio

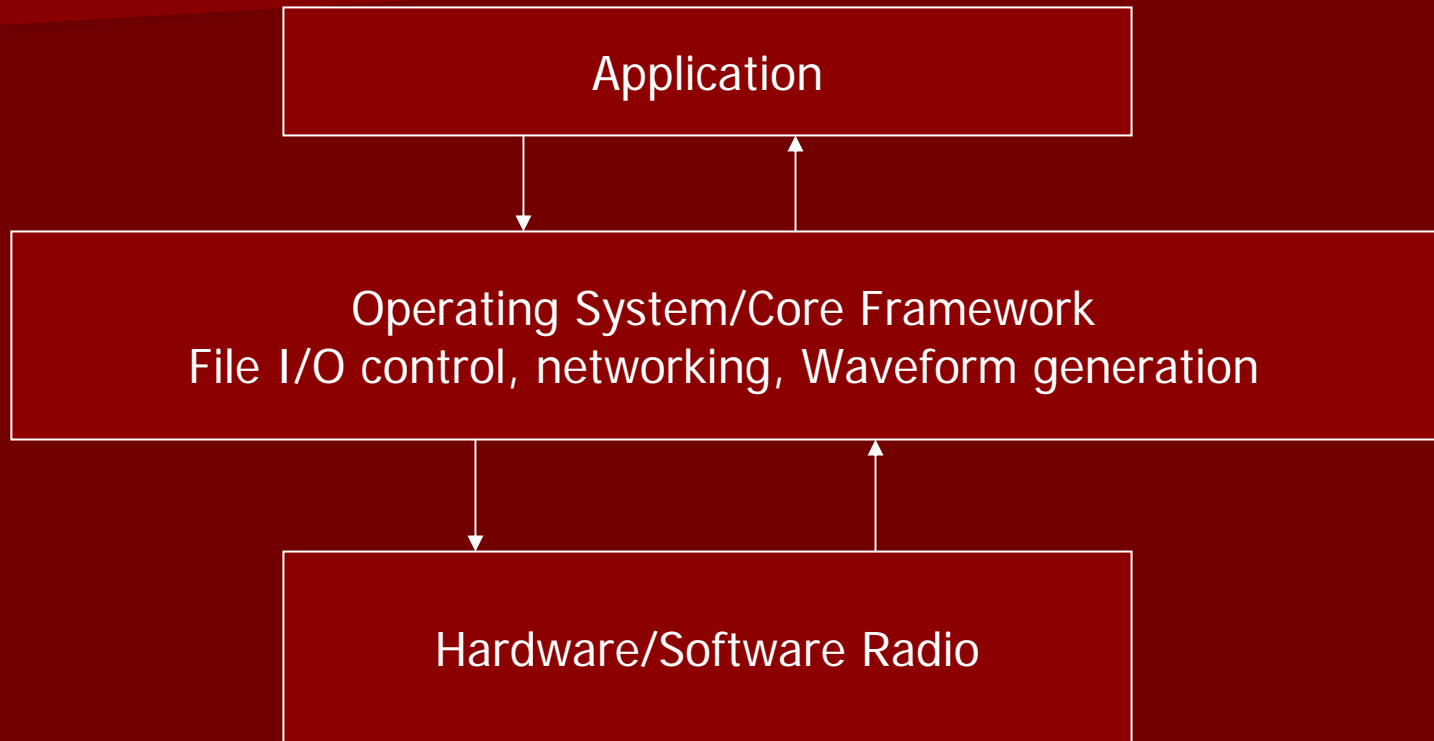
SCA History

- Military realized that their current radios would not be sufficient in the near future.
- Joint Tactical Radio System (JTRS) was created to solve this problem
 - Produced SCA
 - Released to public

Software Communication Architecture

- Goals of SCA
 - Portability of software between different SCA implementations
 - Reduce developmental cost
 - Reduce developmental time by reusing design modules
- SCA is a specification that defines the Core Framework
 - Management
 - Control
 - Configuration

Core Framework



Risks

- I have no experience using Software Communication Architecture
- The Software Communication Architecture development suites that the Wireless Communication lab has access to does not currently have licenses
 - When a licenses is obtained they usually only last for a limited amount of time, which may closes the window for development
- I have never worked with software radios before
 - However I have worked with FPGA's and MCU's before and that's mostly what makes up the accessible parts of a software radio

Interface

The Software Radio already has a built in TCP/IP interface

- Already implemented and functional
- C libraries provided for reading and writing to memory in the DSP chip
- For each frequency band scanned will get a bit
 - 1 for signal detected
 - 0 for no signal detected
- To avoid corruption a simple valid bit will be flipped by the DSP
 - 1 data is valid
 - 0 data is invalid

Initial Schedule Flow

	May				June				July				August				September				October				November to March							
Filter Design	Blue	Blue	Blue	Blue	Blue	Blue																										
Research	Red	Red	Red	Red																												
Design					Red	Red																										
Testing						Red	Red																									
Computer Software									Blue	Blue																						
Graphical Interface and Testing						Red	Red																									
Radio Interface and Testing							Red	Red																								
Software Communication Architecture									Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue												
Research									Red	Red	Red	Red	Red	Red	Red	Red																
Design and Development													Red	Red	Red	Red	Red	Red	Red	Red												
Testing																	Red	Red	Red	Red												
SCA Application																					Blue	Blue	Blue	Blue								
Development																					Red	Red	Red	Red								
Testing																						Red	Red	Red								
Documentation	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
Thesis																									Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue