Is FULLY Software Defined The Future of Wireless?

Manuel Uhm Chair of the Board of Directors – Wireless Innovation Forum Vice President, Marketing – Coherent Logix February 18, 2015







What is *Software Defined Radio* (SDR)?

According to the latest definition agreed upon between the IEEE P1900.1 and the Wireless Innovation Forum, an SDR is:

Radio in which some or all of the Physical Layer Functions are software-defined



Macrocells are SDRs



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Freescale Macrocell Infrastructure Chip

Multicore DSP Array





TI Macrocell Infrastructure Chip

Multicore DSP



TI SDR System Architecture

Source: http://www.ti.com/solution/software-defined-radio-sdr-diagram#





LTE Small Cells are SDRs

TI Small Cell Architecture



Figure 2: TI's small cell software architecture for LTE and WCDMA





Freescale Small Cell Chip





WIRELESS INNOVATION

ORUM



Intel/Mindspeed Small Cell Chip







Even Handsets are SDRs

ARM Mobile Device Reference Design

WIRELESS INNOVATION

RUM





Qualcomm Snapdragon



Nvidia and Icera

Fully Software Defined UE Chipset



NVIDIA Tegra 4i

Highest Performing Single Chip Smertphone Processor 2.3GHz Quad CPU + 60 Core GPU + SDR LTE Half the size of competing chip Tegra 4 super phone experience





Cognitive Radios are SDRs

Cognitive radio is radio in which communication systems are aware of their internal state and environment, such as location and utilization on RF frequency spectrum at that location.

Carlson Wireless: FPGA-Based



This drove Carlson to a core design that is highly customizable. Running on a Xilinx Spartan-6 FPGA with an ARC CPU core and DSP blocks, Carlson is able to meet these requirements and provide TVWS service where needed, today. It's a relatively low cost implementation, able to hit





xG Technology: Coherent Logix HyperX 100 Core DSP-Based



Figure 2. xMax Cognitive Radio Platform





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WIRELESS

Adaptrum: FPGA-Based

Kintex-7 FPGA Receiver Mines TV 'White Space' for New Comms Services

by Mike Santarini Fullisher Xeel Journel Klina, Inc.

Adaptrum is first to market with a full transmission system for services that capitalize on open spectrum. Its product incorporates Xilinx All Programmable FPGAs.







Partial vs Fully Software Defined

The macrocell, small cell and UE implementations (with the exception of Nvidia/Icera) are partially software defined since some key compute intensive functions are hardened (hardware accelerators), such as turbo decoding, MIMO and FFTs. This is done in order to achieve power and/or cost targets.

- The downside is a loss of flexibility, for example, an inability to support an air interface with a different FEC scheme (i.e., LTE turbo decoding vs DVB LDPC decoding), or unable to improve radio performance by updating MIMO or demod algorithms.
- The Nvidia/Icera UE chipset and the cognitive radios previously shown are all fully software defined.
- At the 28nm node and below, it may finally be possible to achieve fully software defined implementations that can meet the power and cost targets for each market segment, including UEs and IoT devices.

TRUE or FALSE?







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