

# Field Programmable Logic Enabling New Software Radio Design

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The communications infrastructure that has become so much a part of daily life is expanding at an exponential rate. To meet consumer, business and life-style demands infrastructure suppliers must build sophisticated systems that no longer simply support telephony services, but provide voice, high bit-rate data, video, image and multimedia capability. These systems must also interact with sophisticated systems like the internet. Human nature dictates that there will be a range of communication standards that evolve. There will also be a range of user terminals that need to be connected to this rich communications tapestry, including cell phones, video phones, satellite phones, PDAs, portable computers and other nomadic computing devices. To flourish and succeed in this dynamic environment equipment suppliers must build highly flexible systems that operate across multiple wireless and wired network standards. They must be able to rapidly adopt new business models as they evolve, and they must be able to incorporate new signal processing techniques that allow increased network capacity, increased coverage, increased quality of service, or a combination of the above. The answer to the diverse range of requirements is the *software defined radio*.

Software defined radios (SDR) are highly configurable hardware platforms that provide the technology for realizing the rapidly expanding third (and future) generation digital wireless communication infrastructure. Many sophisticated signal processing tasks are performed in a SDR, including advanced compression algorithms, power control, channel estimation, equalization, forward error control, adaptive antennas, rake processing in a WCDMA (wideband code division multiple access) system and protocol management. While there are a plethora of silicon alternatives available for implementing the various functions in a SDR, field programmable gate arrays (FPGAs) are an attractive option for many of these tasks for reasons of performance, power consumption and configurability. This presentation will provide an overview of the FPGA implementation of many of these functions. Benchmark data, including performance and FPGA silicon area will be reported. A brief FPGA technology perspective will be presented that summarizes the evolution of FPGAs and shows how these devices have moved to the leadership position for configurable signal processing solutions. An overview of a new FPGA family will be provided that enables many interesting possibilities in the context of SDR.