Embedded digital signal processors for wireless communication systems have stringent design constraints including high computational throughput, low power consumption, and low interrupt latency. Furthermore, these processors should be compiler friendly, so that code for them can quickly be developed in a high-level language. In this talk, I present the design of a high-performance, low-power digital signal processor for wireless communication systems. The processor uses multithreading, vector processing, and powerful compound instructions to provide real-time baseband processing capabilities with very low power consumption. Using a super-computer class vectorizing compiler, the processor performs complete physical layer processing in real-time for several wireless communication protocols. Instruction set extensions to the processor enable very high bandwidth for several important wireless communication algorithms.