

Radio frequency semiconductors at the crossroads

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In the future, the first time most people will access the internet, the device they will use will be a smartphone. In addition, monthly mobile video traffic will exceed the total history of all broadcast TV by 2014. These two facts require a revolution in our approach to RF semiconductor products and architectures.

The ubiquity of smartphones for data, video and internet access has already created a bewildering array of radio channels. The 2012 cellular front-end architecture already has 17 transmit/receive paths, and this does not include WLAN, GPS, BT, Zigbee or NFC. Discrete radio chains with separate filtering and switching have reached the limit of acceptable complexity. At the same time, it is clear that only a limited number of these radio chains are required to operate simultaneously, or in a single geography. The need for adaptive, software-defined or -cognizant radios is palpable, but none of these approaches has yet been proven to be ready for prime time.

Further, the industry drive towards SoC integration has actually reversed for RF transceivers, where time to market and complexity is driving disintegration of the front end, and performance is driving the use of compound semiconductors for critical PA and LNA functions and SAW/BAW technologies for high-performance filtering.

The need for more and higher speed data is also driving a trend to increased constellation and OFDM modulation. Wireless data rates exceeding 1 Gb/s are currently being deployed with the 802.11ac standard using 256QAM and up to 8x8 MIMO. The increased linearity is driving a need for predistortion, calibration and linearizing circuitry, and will almost certainly required communication between the baseband and RF functions, another radical change to the 50 Ω in/50 Ω out RF mentality. The increase linearity and complexity has also driven higher current, an unacceptable solution in battery-powered devices, where the mandate is increasing battery life. Certainly, more intelligent power management, as well as RF power control will be required to meet these needs.

The architectures and products currently deployed by our industry are insufficient to meet the demands of the consumer. A revolution is required, and the technologies, designs and architectures that drive this revolution will dominate our industry.

