

An inside look at fabless start-ups on the horizon

Some pundits have said that the number of semiconductor companies will decrease during the coming years. If the past quarter is any indication, I'd say, "I think not." Application areas such as storage, wireless, electronic design automation (EDA), printed polymer/organic ICs and consumer multimedia have experienced strong start-up activity.

While picking a winner – and that's a winner from companies that have already secured venture funding, a strong endorsement in and of itself – is always a challenge, this quarter's choice was easy. Emerging markets are frightening – some emerge, some don't. Chasing standards takes a strong stomach and always results in a battlefield littered with casualties. My favorites have always been companies that address existing large market opportunities with innovative technology. When I get that call to join the venture frenzy, that will continue to be my theme.

For this issue, **Provigent** clearly fits that large market, innovative technology bill. Provigent was founded in August 2000 to develop "integrated silicon solutions for the broadband wireless industry." The company has raised \$19 million to date, a relatively modest amount, from Sequoia Capital, Pitango Venture Capital, Magnum Communications Fund, Ascend Technology Ventures, Delta Ventures and Dr. Andrew Viterbi, co-founder of QUALCOMM. The company has roughly 40 employees.

Today's wireless fabless start-ups all chase standards such as 802.11, WiMAX, UWB or Zigbee. Meanwhile, the proprietary point-to-point systems market size was roughly \$3.5 billion in 2003, representing a larger opportunity than Wi-Fi during that time period. Today, each of the 150 proprietary PTP systems vendors must design their own in-house solution, an expensive proposition.

The PVG310, Provigent's flagship product, is a complete single-chip modem that integrates all the physical-layer baseband functionality (modulation, demodulation and forward error correction) for point-to-point broadband wireless transmission. The chip is highly integrated, configurable and flexible with improved signal processing and digital signal processor (DSP) algorithms, allowing it to serve as the heart of numerous proprietary PTP systems. The PVG310 is fabricated by an Asian foundry in 0.18-micron CMOS.

Modem parameters – including data rates, modulation schemes and bandwidth – are all software programmable, making the PVG310 the modem core of the IDU (indoor unit) or ODU (outdoor unit) for a broad variety of systems. System vendors can leverage the device to develop a single design for their entire point-to-point product line, from low-capacity, low-cost systems to high-end, high-capacity, feature-rich systems.

Microwave radio energy travels in waves, transmitting in both horizontal and vertical directions. This physical phenomenon enables the transmission of radio frequency (RF) waves on both polarizations at the same time. Co-channel dual-polarization (CCDP) transmission provides two parallel communication channels over the

same link with orthogonal polarizations, thus doubling the link capacity. Separate and independent signals are transmitted over the same wireless channel using a single antenna – pretty cool.

However, despite the orthogonality of the two signals, some interference between the signals inevitably occurs, due to imperfect antenna isolation and channel degradation. The PVG310 uses cross-polarization interface cancellation technology (XPIC) to double wireless channel capacity. CCDP operation using XPIC technology allows operators to build networks that transmit up to 311Mbps over 28MHz channels and up to 622Mbps over 50/56MHz channels, achieving a spectral efficiency of 13.5 bits/Hz. In contrast, 802.11b and 802.11a/g systems achieve 1-bit/Hz and 2.7-bits/Hz, respectively, and today's proprietary PTP systems achieve 3-5 bits/Hz.

Provigent targets all three major segments of the broadband wireless transmission market – cellular backhaul infrastructure, fixed wireless transmission and private wireless networks. Point-to-point radio systems based on the PVG310 are being designed by leading system vendors worldwide. Provigent has customers and orders, and is shipping production units. Future plans call for high integration and performance.

Competing solutions have limited performance and are less integrated, according to Provigent. OFDM-based solutions are not appropriate for high-frequency systems. Most of the competition comes from expensive in-house efforts at the system vendors.

Provigent's solution is highly integrated, supports dozens of proprietary modes and features improved signal processing algorithms. In addition, the company argues that WiMAX represents a large distraction for many vendors. ■

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