

BROADBAND WIRELESS BUSINESS

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50 Installations in 22 Countries

Aperto Networks' Real Market Approach

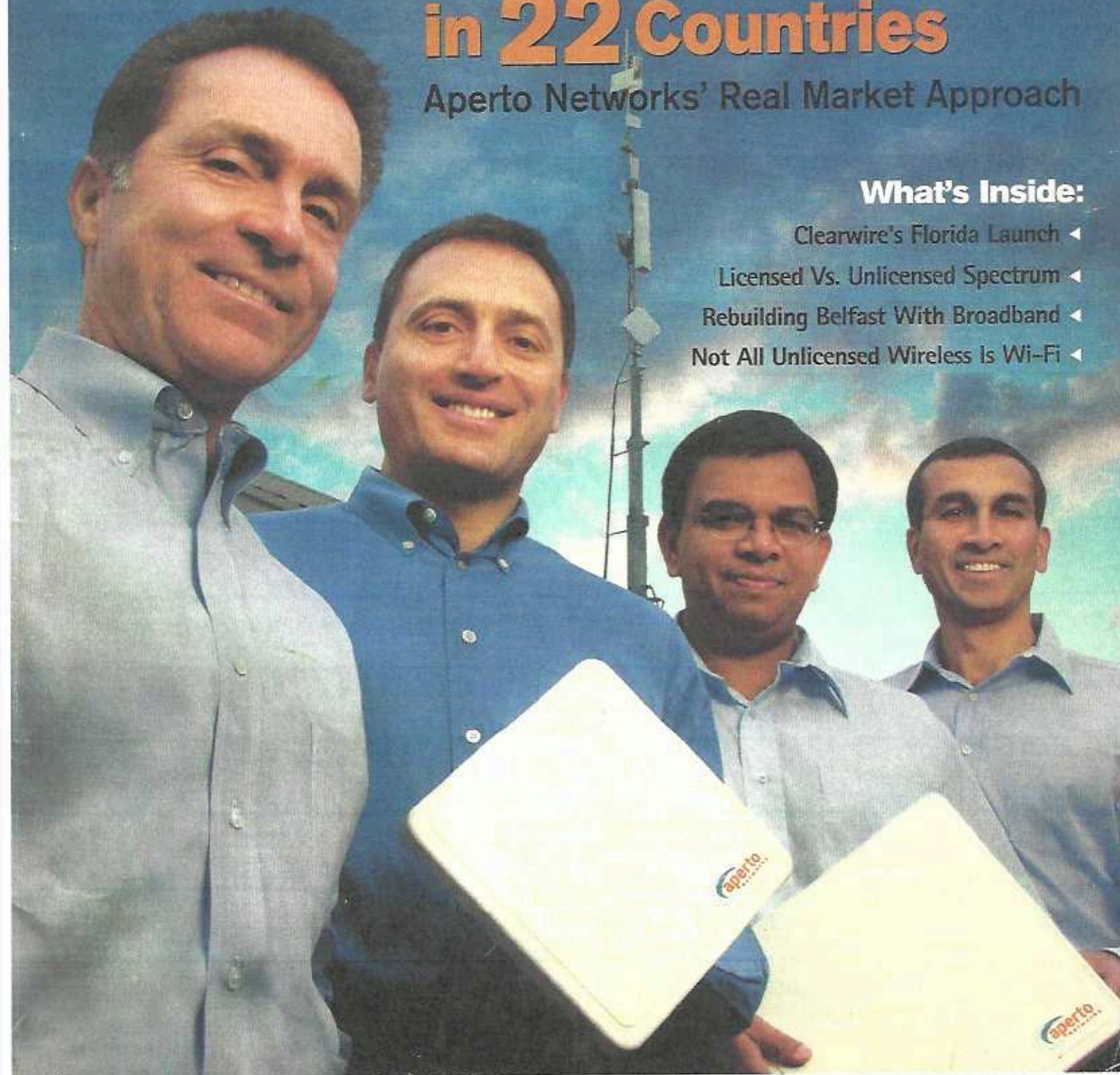
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The Aperto Networks executive team, left to right: Amir Ameri (VP of operations and CFO); Dr. Reza Ahy (president, CEO and chair); Dr. Subir Varma (VP of network technology); and Alan Menezes (VP of marketing). Other executive team members not shown: Francois Le (VP of sales) and Sue Chan (VP of human resources). Dr. Ahy and Dr. Varma are holding the 5.8 GHz and 3.5 GHz PacketWave antennas. In the background is Aperto's radio tower, with PacketWave base station antennas and multiple subscriber antennas.

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Aperto

Aperto Networks' Real Market Approach

The Broadband Wireless Equipment Developer Aims To Balance Performance and Cost Issues While Meeting Service Provider Needs for Capacity and Service Differentiation

By Kaitlyn Trent

Among second-generation broadband wireless access equipment makers, Aperto Networks is surprisingly successful. While others have stalled waiting for markets to develop or funding to come through, and still others have gone bankrupt outright, Aperto has quietly and steadily been establishing a viable business. What's surprising is that they have done this with significantly less time and money than other companies founded at about the same time.

Aperto recently raised \$22 million in a third round of funding, bringing the total amount raised since the company's founding in 1999 to a relatively modest \$57 million. While some competitors have burned through two or three times more cash but still seem to be in trial mode, Aperto's systems are deployed by 50 service providers in more than 22 countries. The company is currently engaged in its sixth quarter of shipping products, recording 50 to 100 percent quarterly income growth along the way.



The Aperto Networks executive team (left to right) with PacketWave products: Dr. Reza Ahy (president, CEO and chair); Amir Ameri (VP of operations and CFO); Alan Menezes (VP of marketing) and Dr. Subir Varma (VP of network technology).

Staying on Target

Aperto has proven its technology to be robust and its business and product strategies to be sound. Equally important, it seems, is the fact that they have not deviated from the strategies as laid out when the company was launched three and a half years ago. Their goal at that time was to build a product that would work at multiple frequencies, would scale, would serve business users with multiple business-class services, and above all, would be economically practical to deploy. Aperto has met its goals — the company is generating revenue and has somehow managed to eliminate the product-revision delays and other setbacks that have foiled many competitors.

"We expect to be profitable next year," said Reza Ahy, Aperto founder and CEO. "We're experiencing growing interest from operators around the world, particularly in Europe, Asia-Pacific, and Latin America, and we also expect growth in the U.S. in

the 5 GHz band. We attracted our current round of investment because of the momentum we've established and because we have solidly executed on our business plan."

The new cash infusion will allow Aperto to add sales resources to address the growing interest in their products from around the world and to build on the foundation the company has established. The funding, led by Canaan Partners, represents a renewed vote of confidence for the broadband wireless industry in general, and for Aperto in particular.

"Our business model is entirely different from other equipment providers," said Alan Menezes, Aperto's VP of marketing. "Unlike those who developed product for only one band, such as the 2.5 GHz band, or one capability, such as indoor install, we designed our product right up front to support multiple bands in multiple countries — both licensed and unlicensed — and to

address real-market requirements with effective solutions. We are now certified in 24 countries — U.S., Russia, Africa, Poland, Latin America and China, to name a few. Our success is based on band diversity, economic viability, product scalability and our ability to deliver true business-class services."

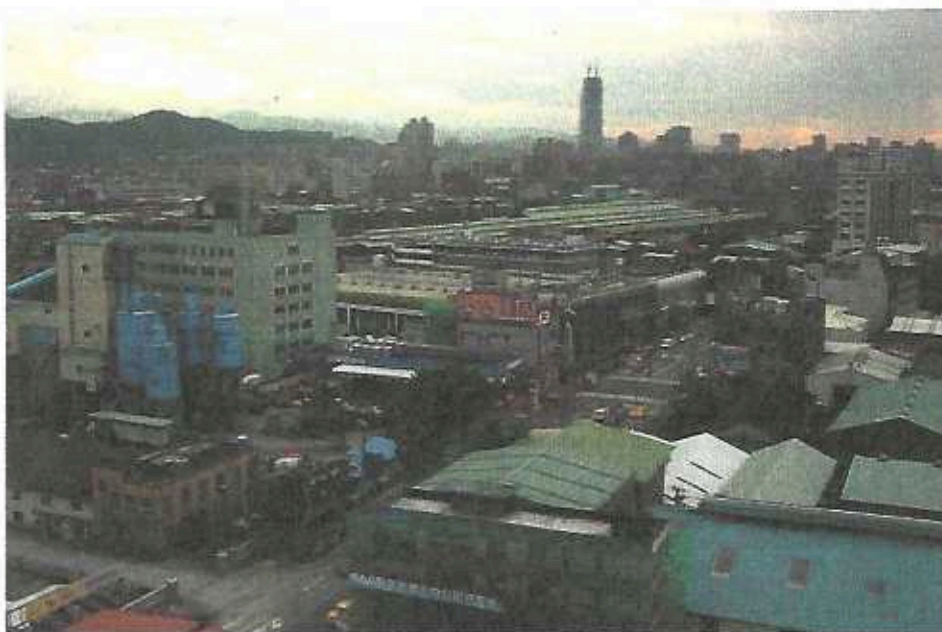
Business-Class Technology

Aperto's PacketWave system works in the 2.5 GHz, 3.5 GHz and 5 GHz bands. The airlink technology, called RapidBurst, delivers up to 20 Mbps burst-mode capacity in a single 6 MHz channel. The highlight of the PacketWave system is its medium access control (MAC) technology on which Aperto owns multiple patents. Called OptimaLink, the technology dynamically adjusts ten different link parameters on a burst-by-burst basis, thereby optimizing coverage and capacity while maintaining high spectral efficiency.

On-the-fly, OptimaLink adjusts power, modulation (QPSK or 16 QAM), FEC (forward error correction), ARQ (automatic retransmission request), frame size, equalization, spatial diversity, symbol rate and downstream/upstream capacity. To support the company's strategy of delivering true business-class services, Aperto's PacketWave also has the ability to deliver multiservice, quality of service, per-flow service and bandwidth management for service level agreements. Even though Aperto has been around awhile, relatively speaking, their technology is quite leading edge.

"Our OptimaLink technology measures all the factors that affect link performance and immediately customizes the link. For example, if a customer happens to be in a challenging propagation area, we can change the modulation, frame size or polarization or whatever is needed. The point is, the propagation characteristics are going to be different for every subscriber and we don't want to penalize many users for the sake of one or two, so we adjust the link parameters on a subscriber-by-subscriber basis."

Knowing that the market for the delivery of business services is where they wanted to be and where their service provider customers would get



Rooftop view of the city of Shahe, China, where Gold Mind Telecom has deployed Aperto's 5.8 GHz PacketWave equipment.

the fastest payback, Aperto focused careful attention on developing business-class services. PacketWave can deliver three classes of service — best effort, CIR (committed information rate) or CBR (constant bit rate), and up to 16 defined service flows. This kind of quality-of-service sophistication has distinguished Aperto from other equipment vendors, and it has enabled service providers using Aperto's systems to offer differentiated business services that add a competitive edge in their markets.

"The consumer market is tough and won't provide payback for four to five years, which is why we have focused first on the business market where payback is around 18 months," Menezes said. "The consumer market will get here, but it is not here yet. It will be much the same way the


cellular market developed — cellular infrastructure was all paid for with business users and residential users came later when the price came down."


The Non-Line-of-Sight Issue

When Aperto was founded, was it ahead in the game? Other technology companies have developed seemingly more advanced, indoor-install, non-line-of-sight technologies targeted at consumers. Such companies may be getting more media attention than Aperto, but they have not been nearly so successful.

"There has been a lot of hype surrounding non-line-of-sight and indoor install capability," Menezes said. "It is important to have non-line-of-sight and we do have

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Real Market Approach

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it, but it is even more important to use it cost-effectively. No one can do non-line-of-sight beyond 5 miles. We can do non-line-of-sight at fairly short distances, just like the others, but the indoor-install claimants are not realistic. The concept of indoor install is attractive, but it is entirely too unpredictable in the real world. The varying number of interior walls, nonuniform building materials, etc., prevent uniform service delivery. You not only have to have higher power and more expensive units, you have to backhaul a very big network with many, many cells, because the cell size for indoor install is very small. That is why our solution is outdoor install — not as glamorous, but infinitely more practical and cost-effective."

A Networking Company

With Aperto, it can be said that the whole is greater than the sum of its parts. They have designed a comprehensive system that adheres to established standards. It includes many of the latest wireless technological developments, as well as non-wireless technologies, that enhance the subscriber unit and interconnection to the network.

Aperto's subscriber unit comes in three different versions to appeal to SME (small-to-medium enterprise) or SOHO (small office/home office) customers. It supports bridging, routing, network address translation and even has a built-in Dynamic Host Configuration Protocol (DHCP) server.

On the network side, the base station has multiple IP features. It can be configured as a router or a bridge and also allows the operator to create subnets. In each sector of either 60 or 90 degrees, the system can support a subnet or multiple subnets. The system also includes advanced functionality for operators, such as a Web-based interface, network management software with built-in Simple Network Management Protocol (SNMP) capabilities, and a Java-based configuration manager.

"We really are a networking company, in addition to being a wireless company,"

Menezes said. "We built our company to address real-market requirements, which we know are business-class services, quality of service and capacity. Our customers like our products because on both the network side and the subscriber side, we have provided so much functionality that the need to buy ancillary equipment is greatly reduced — we are very economical for operators in that regard."

Beyond the Second Tier

Aperto has announced deployments with key operators around the world, including TowerStream of Boston, Conterra LLC of South Carolina, Internet Partners of Poland, Gold Mind Telecom of China and Illuminat of Trinidad and Tobago. These deployments are significant and belie the claim that broadband wireless is only for second-tier cities. TowerStream is deployed in metro Boston and is delivering business-grade services to SMEs. Internet Partners of Poland, in a nationwide deployment, is serving thousands of business subscribers throughout Poland's largest metropolitan markets, including Warsaw and Gdansk.

The deployments just mentioned are operating in the 5 GHz band. TowerStream in the United States is operating its Aperto equipment in the 5.8 GHz unlicensed band. The FCC recently redefined that band in a decision that should smooth the way for Aperto to penetrate more of the U.S. market. The FCC's decision now allows non-spread-spectrum systems to operate in the colocated ISM band. That means Aperto can recertify their products for the combined overlapping U-NII/ISM bands, which totals 125 MHz as opposed to the 100 MHz of the U-NII band. This is a boon to Aperto, which is better positioned than others to capitalize on the new FCC rules, according to Menezes.

"Because we use a narrow 6 MHz channel, we can now deploy 20 nonoverlapping 6 MHz channels, versus the typical competitive norm of five wide channels of 20 to 25 MHz each," he said. "This gives us improved coverage and the ability to extend cell radius from 5 to 8 miles, and improved interference-resilience, which

enables multiple service providers to operate in the same area. We believe this will be a great stimulant to growth in the 5 GHz band in the U.S."

Aperto has been active in the IEEE 802.16a standards development effort from the beginning. Their technology adheres to the standard in both the PHY (physical) and MAC layers and can be viewed as a "superset" of what is outlined in the standard. The PacketWave system is based on single-carrier technology, and uses TDD and TDMA. Although some of the newer technologies are touting OFDM as a better way to achieve non-line-of-sight, Aperto is quick to point out that OFDM in the PHY layer is only one of the things needed to achieve non-line-of-sight and that it is not a solution in and of itself.

Aperto has looked at the whole system and figured out how to build a high-performance radio at lower cost. This is demonstrated in the way Aperto has improved signal strength and non-line-of-sight capability through the use of multiple antennas. Aperto's use of multiple antennas is practical in that it achieves results similar to MIMO (multiple input multiple output) technology but at a lower cost. Aperto's technology should not be confused with MIMO technology, which was much-hyped a couple of years ago but proved to be prohibitively expensive.

Aperto has been pragmatic in all respects. They have approached the markets for broadband wireless with a clear plan and have developed technology that seems to have achieved the right balance between performance and cost-effectiveness. If it is true that the fixed wireless industry is beginning to show signs of recovery, 2003 is going to be a great year for Aperto.

About the Author • Kaitlyn Trent has been involved in the wireless industry for over a decade. She is based in Redmond, Wash.

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