Corporate Backgrounder

Business Summary

Aperto Networks is a developer of multi-service fixed broadband wireless access systems. The company was founded to provide a breakthrough solution to one of today's critical network bottlenecks – limited availability of last mile broadband access to millions of prospective users worldwide. With scalable systems and patent-pending technology that support new wireless builds and complement existing wireline broadband access technology, Aperto addresses service providers' needs for rapid network deployment, multi-service scalability, ease of installation and cost-effectiveness. Aperto will dramatically shorten the lengthy provisioning cycles of broadband services by enabling rapid service provisioning and service reconfiguration across dense urban to suburban locations.

Aperto has attracted top management, engineering, sales, marketing and support talent from leading high technology companies. Areas of technical specialties include high-speed wireless access, MAC layer and IP routing protocols, WAN access, ATM/Frame Relay switching and network management. The team's deep experience extends to first-generation MMDS, telecommunications, networking, cellular, DSL, optical and enterprise wireless systems.

The company's 80+ technical experts bring strong system-level understanding of applications, carrier services, signaling, end-to-end network protocols, physical layer and upper layer technologies. The principals have been responsible for successful development and delivery of previous generation wireless infrastructure for carriers and enterprises.

Market Dynamics

With Internet traffic growing exponentially, service providers are focused on deploying technologies that meet the urgent need for affordable, high-speed access for small/medium businesses, remote offices and residential users. The most common access technologies for these users today are V.90 modems, ISDN, DSL and cable modems – each with limitations in customer reach, robustness, capacity and speed of deployment.

Last mile high-speed access has significantly lagged both the LAN and WAN backbone in terms of bandwidth capacity and broad deployment, creating a choke point for end-to-end broadband networks. Developments such as cable modems and DSL have improved access incrementally over prior alternatives such as T1, ISDN and dial-up. These solutions, however, do not provide *ubiquitous* broadband access. Most have significant limitations for service delivery and cannot meet increasing demands for more bandwidth and new services. Fiber-based connections remain cost prohibitive for mass-market access and distribution. All existing wireline solutions suffer from inability to support rapid provisioning.

Changing market dynamics and technology advances in fixed wireless broadband access are giving service providers new options for serving growing demand. With the issue of the September 1998 FCC Report and Order opening up Multichannel Multipoint Distribution Service (MMDS) for flexible two-way use, wireless technology has become a highly attractive vehicle to bypass the local loop. Companies such as MCI WorldCom and Sprint have spent nearly $3 billion in the acquisition of U.S. MMDS licenses, to directly access customers and complement their extensive, existing wireline infrastructures. Furthermore, new frequencies specifically opened for fixed broadband wireless access services, such as the 5 GHz UNII band in the U.S.

and the 3.5 GHz band being licensed in Europe and Latin America, have opened new possibilities for emerging alternate carriers.

According to International Data Corporation (IDC), the U.S. fixed wireless broadband services market will grow from $767 million in 1998 to $7.4 billion in 2003. The Strategis Group estimates that global service revenues for fixed broadband wireless will reach $16.3 billion in 2004, a compound annual growth rate of 140% over 1999 revenues. Allied Business Intelligence further documents that service providers will turn to wireless infrastructure builds to shrink deployment cycles, reduce congestion and lower dependency on existing facilities.

While current access technologies such as DSL and cable modems address the need for high-speed access, until now not enough has been done to improve customer reach and affordability for the mainstream. The highly competitive service provider market demands more. Aperto has a strong focus on scalability to support viable mass deployment of broadband services across urban, suburban and rural environments.

Key Technology Developments

Aperto Networks is dedicated to delivering five primary benefits:

- **Rapid network deployment**
- **Network scalability**
- **Multi-service scalability**
- **Ease of installation**
- **Cost-effectiveness**

To develop a wireless architecture for mass-market scale, Aperto Networks is focused on bringing fixed wireless access up to and beyond the performance of wireline broadband access. This means standards-based access systems supporting dense cellular deployments, high network scalability, line-of-sight and non-line-of-sight operations, and end-to-end QoS management in point-to-multipoint topologies. Aperto has defined its architecture to meet these parameters, as well as additional characteristics carriers consider to be “must-haves” for next-generation, cost-effective broadband networks, i.e., an IP-based and multi-service design, an adaptive physical layer (radio and modem), advanced Media Access Control Layer and high cellular frequency reuse.

Building on this open architecture, Aperto has developed three unique technical innovations to further extend network tunability and cost-effective service delivery:

- **ServiceQ** provides three distinct service classes over variable-capacity user links. It enables Quality of Service (QoS) and bandwidth management across the wireless (air) interface, and seamlessly interworks with industry-standard IP DiffServ and MPLS protocols to extend service classes through backhaul networks.

- **OptimaLink** performs dynamic control of link parameters to optimize each subscriber connection in a multi-user, point-to-multipoint environment. Ten multi-layer link parameters are adjusted on a burst-by-burst basis to maximize coverage and capacity while maintaining a high level of spectral efficiency. This ensures a high degree of robustness in the link, multipath immunity, interference management, and operation in obstructed and non-line-of-sight conditions.

- **RapidBurst** delivers high-capacity, flexible two-way burst-mode TDMA. It achieves unprecedented flexibility in allowing control of transmission parameters, enabling both the OptimaLink and ServiceQ algorithms to function effectively.

Aperto is developing standards-based wireless access equipment for global markets in the 2.5 GHz MMDS, 3.5 GHz and 5 GHz frequency bands. By operating in three different bands**,** and using a flexible Media Access Control layer which can support both TDD or FDD, Aperto ensures that it will meet the stringent requirements, regulations and standards of service providers worldwide, with a single, integrated product family.

In frequency bands where structured channel pairs do not exist, adaptive TDD provides a highly flexible and efficient duplexing scheme whereby a single channel is used for both upstream and downstream transmissions. TDD systems can also dynamically adjust to changes in downstream and upstream traffic patterns. These systems can make use of every available channel in a well-designed cellular environment for optimum capacity, coverage and cost.

Funding History

Aperto Networks was founded in 1999 and is privately held. The company has raised over $33 million in private equity financing from Alliance Ventures, Tyco Ventures, Ridgewood Capital, Satwik Ventures, DMC Stratex Networks, Redwood Ventures, Oki Electric Industry Company, Mitsubishi International Corporation and other strategic private investors.

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