$100 laptops feature novel peer-to-peer wireless connectivity

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The first **$100 laptops** being developed by **MIT's Media Laboratory** for the non-profit organization One Laptop Per Child (OLPC) may be distributed to students by late 2006. The ability of this laptop to achieve its mission depends on the implementation of its unique built-in wireless capabilities. While connectivity is provided by four USB ports, the laptop also supports WiFi and voice-over-Internet protocol (VoIP). The latter will enable a "walkie talkie" feature for the laptops, complementing their peer-to-peer file sharing capability.

The $100 laptop operates from four "C" cell batteries that can be recharged by turning the crank on the side of the unit, thus ensuring the unit can operate as a truly mobile platform. Michail Bletsas of MIT's Media Laboratory stated the energy budget for the system using this power source is about 3 W: 1 W for the display, 0.9 W nominal (2 W peak) for the microprocessor, and approximately 500 mW for the wireless capabilty, possibly falling to 250 mW after refinements.

While the electrical specifications of the wireless capability are significant, the quality of the ad-hoc networking stack and the wireless card driver for the laptops' Linux operating system are of greater importance. According to Bletsas, an adapter/driver combination like the Atheros/madwifi combo appears to be the best option, but a final decision has not been made.

Nortel Networks is the official networking partner of the project and has recently become the sixth corporate sponsor of OLPC, joining AMD, Google, Brightstar, News Corp. and Red Hat. Bletsas stated the main goals for the units are to optimize both peer-to-peer and laptop-to-Internet wireless connectivity. According to Bletsas, there is no standard system for ad-hoc peer-to-peer networking on the scale planned for these laptops. Therefore, solutions at every level of the network stack will be implemented. These solutions will be observed in the field and then evaluated, the merit of each being based on user response.

One networking solution for the $100 laptop, operating at the Internet address level (or Layer 3), is the ad-hoc routing protocol AODV. There is also MIT's Roofnet software (a Layer 2.5 solution). Bletsas refers to the Layer 2 stack as the simple breathing ad-hoc software layer that uses wireless distribution system support. It resembles the emerging **802.11s** standard. Two protocols for the definition of this standard are **WiMesh,** supported by Nortel and others, and SEEMesh, whose backers include Intel, Motorola and Nokia.

To address the challenge of providing access to the Internet, Bletsas shared that multiple scenerios will be considered here as well. In urban areas, besides the well-known wireline solutions, one or two laptops per classroom might use USB-equipped GSM phones as a wireless modem to provide an Internet connection to all remaining laptops. In rural areas, a satellite link could provide an Internet gateway that could be accessed at the school district level by a long-range wireless link such as WiMax.

Because Internet access is a matter that relates to a nation's broader infrastructure, part of the strategy to enable Internet access for the laptops is to shape the regulations governing the emerging wireless industries in developing countries. In that regard Bletsas states that two goals are particularly important. First, a set of frequency ranges for unlicensed bandwidth must be clearly defined. Second, a special class of cellular service should be provided to accommodate low-priority data using idle bandwidth. Says Bletsas, "Whenever the cellular networks need all of their bandwidth, they can gladly drop our bits."

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