

# Standardizing on Wireless LANs

**Integrating WLAN technology saves time, reduces costs, and adds value for Intel**

At Intel, we've discovered that using wireless as a primary network connectivity method can offer significant advantages over more traditional wired network models.

Faced with a mandate to reduce network costs, our IT managers took a hard look at the data, voice, and video services we provide to Intel employees.

But instead of viewing wireless technologies as an extra-cost addition to the infrastructure, we took a different approach: We made wireless an integral part of our standard network infrastructure.

Almost immediately, we began seeing real financial benefits to this approach: When used as a primary form of connectivity, wireless can dramatically reduce capital and operational costs over equivalent all-wired networks.

## Intel's IT Infrastructure

- 159,000 LAN nodes
- 70,000 mobile PCs
- 34,000 desktop PCs
- 10,000 handhelds
- 3,900 wireless access points
- 30,000 wireless-enabled users

## Why is Intel Moving to Wireless LANs?



- We can reduce equipment maintenance costs.
- We can lower the costs of wiring (or upgrading) networks in Intel buildings.
- We can lower our network total cost of ownership (TCO) with WLAN designs.
- We can increase employee productivity.
- We can reduce security risks.

## We Can Reduce Equipment Maintenance Costs

When we investigated the costs of our existing LAN infrastructure, we discovered what many IT operations have found: There's a great and sometimes hidden disparity between the costs of maintaining aging equipment over new.

Analyzing our own networking costs, we found that a 10/100 Mbps switch that cost us \$50,000 five years ago has dropped in price to about \$10,000 today. But maintenance on that now fully depreciated switch—at about 10 percent of the original list price—totals about \$5,000 per year.

High maintenance costs make it potentially less expensive for us to replace older network equipment with new. Purchasing a \$10,000 switch will reduce our maintenance costs to about \$1,000 per year, and with an average \$2,500 annual depreciation over four years, saves \$1,500.

## We Can Lower the Costs of Wiring Buildings

Wiring a new building for voice and data network is expensive; replacing aging wiring in an older building can be even more costly.

We can greatly reduce the costs of running cable through a building or campus by opting instead to install a wireless network of access points. We've found that this can be especially cost-effective when voice and data are combined.

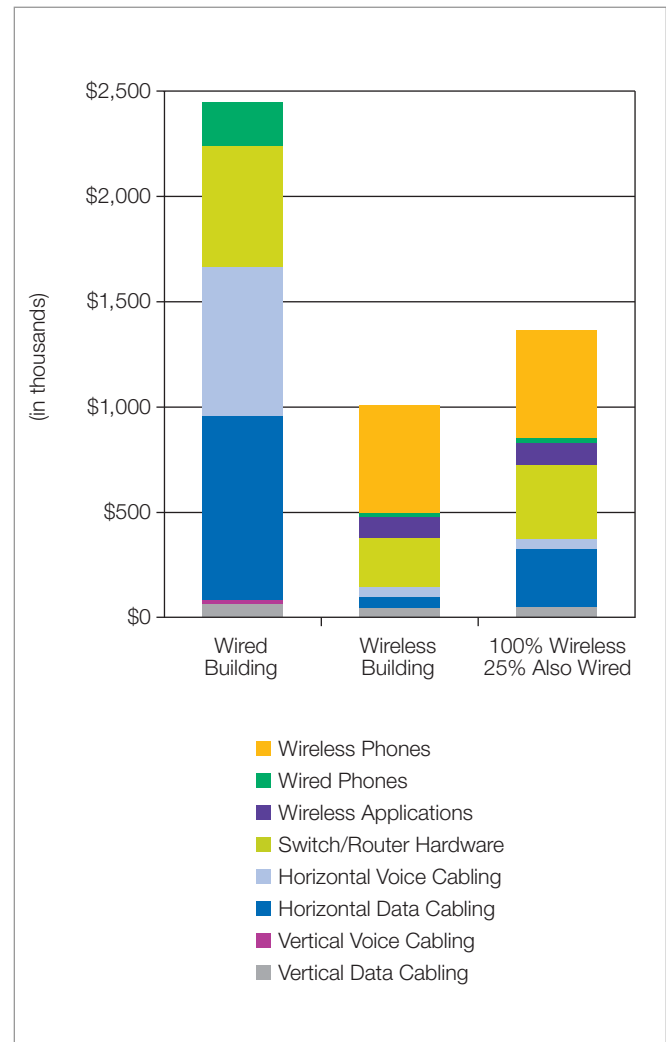
Ignoring the datacenter itself for a moment, we've found there are four key elements to providing networking services to office workers:

**Cable plant.** This includes vertical cabling that interconnects satellite equipment control rooms (SCR) and horizontal cabling from the SCR to the user.

**Computer connectivity.** The actual connection made between a user's computer and the network, generally a Cat5+ cable and a spare, attached to a port in a 10/100 Mbps switch in the SCR.

**Phone connectivity.** Voice capabilities, generally provided with a Cat3+ cable attached to the user's hard-wired phone, connecting the phone to a port in the PBX using interconnected copper cables (horizontal and vertical).

Figure 1. Network Building Costs



**Security** is an essential capability in the network protecting computers and eventually voice from cyber attack. Security systems reside in both the computers and the network equipment.

Our cabling and PBX costs remained relatively flat in the past few years; product prices fell, but were balanced by rising labor and maintenance costs.

But we've found there is significant capital (and operational) expense in building and maintaining cable plants and LAN devices. We've identified this area as providing good opportunities for cost savings and productivity enhancements.

By reducing the level of cabling in our existing (and new) networks, replacing wired connections to the desktop with wireless for voice and computer connectivity, we can significantly reduce the costs associated with cable plants and LAN equipment.

In Figure 1, on the previous page, we examine the costs of wired versus wireless in a building with two data and one voice cable per 6-foot office cubicle. We assumed a “wireless” building that incorporated 100 percent coverage for wireless laptops and desktops, 90 percent wireless mobile phones and only 10 percent wired phones. Even a mixed-mode network of 100 percent wireless and an additional 25 percent wired cubicles for high-end users can offer substantial savings over wired-only infrastructure.

## Employees Become More Productive

A few years ago, we embarked on a program to reverse the usual 80:20 ratio of desktop to notebook computers in the average corporate enterprise. We began wireless mobile deployments throughout our enterprise in 2002.

By the end of 2003, notebook computers comprised 66 percent of our client PC population. Of the 30,500 PCs we refreshed (upgraded) in 2003, 25,000 were notebooks. More than 30,000 client systems are now wireless-enabled.

During 2004, we studied 100 employees given new notebooks incorporating Intel® Centrino™ mobile technology and subscriptions to wireless hotspot services. The addition of wireless capabilities literally changed the way these employees worked, giving them better, faster access to real-time data for decision-making, and allowing them to choose when and where they worked.

Using wireless public and private network services, these employees gained an average of two hours of useful working time per week, or more than 100 hours per year. Although the study measured the time savings for only a small number of tasks, we concluded that the gains in productivity more than paid for the costs of deploying the new machines. (For more on this study, see [www.intel.com/IT](http://www.intel.com/IT))

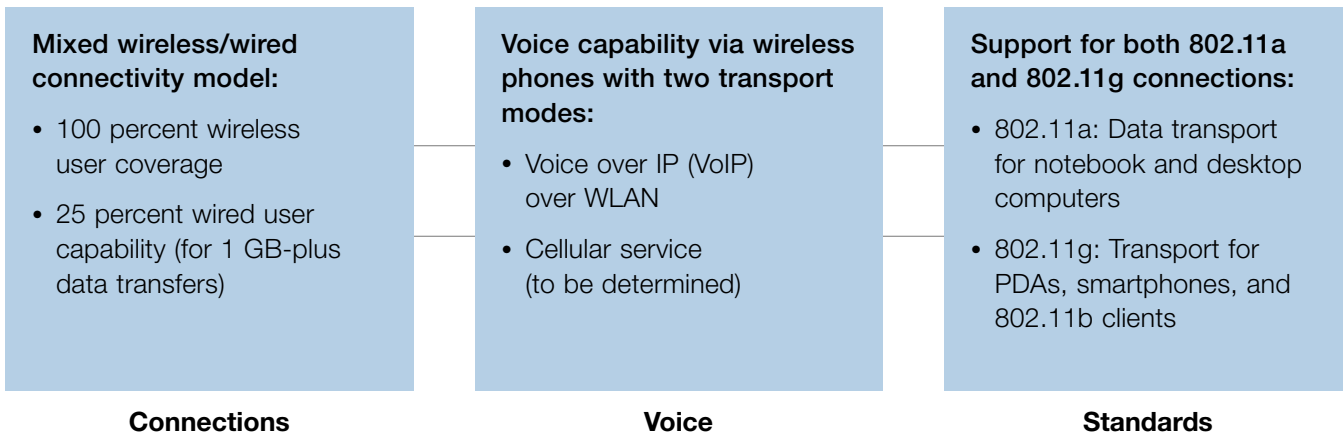
## We Can Reduce Security Risks

But another important finding emerged from that study: The more experience that employees have with wireless mobile technology, the more of it they will demand. In fact, many employees in the study reported that they used wireless connections at their desks, even when a wired connection was available.

This can have serious implications for network security. Low-cost wireless access points (APs)—sometimes selling for less than \$50—are easy to install and a tempting option for users in buildings that as yet don’t offer wireless network access.

These “rogue” access points can leave an otherwise secure network open to unauthorized intruders. They are a growing problem for many networks, especially networks that have opted to forbid wireless access. When wireless network access is not offered in a systematic and secure manner, users may be tempted to install unauthorized and insecure wireless solutions.

## Intel IT’s Next-Generation LAN Plans



**Table 1. Wireless Can Reduce Intel's Network Costs**

	<b>Capital Expenses</b>	<b>Additional Operational Expenses</b>
<b>100% Wired Cost</b>	\$2,424,000	\$648,000
<b>100% Wireless Cost</b>	\$1,010,000	\$354,000
<b>100% Wireless Savings</b>	58.3%	45.3%
<b>100:25% Wireless/Wired Mixed Model Cost</b>	\$1,364,000	\$516,000
<b>100:25% Wireless/Wired Mixed Model Savings</b>	43.7%	20.3%

**Trading wired for wireless buildings can cut costs in half.** Analyzing the costs of building connectivity into a new four-story building for 1,600 users, we discovered that we could reduce our capital expenditures by nearly 60 percent, and reduce the annual cost of operating the network by more than 45 percent.

Providing secure wireless service is a key part of that defense. Elevated security levels has become increasingly important for all types of network access, wired and wireless, local and remote. By redesigning our networks to incorporate additional security measures, we hope to mitigate our exposure.

## Going Forward

We've begun preliminary work in developing our next-generation LAN infrastructure within Intel, which will consist of 100 percent wireless connectivity for all users. We anticipate a demand for wired network transport—which will enable high-end users to transfer extremely large data files across the network quickly.

During 2004, we will continue to test and integrate new wireless technologies for our next-generation LAN (NGLAN). We will deploy fully capable voice and data “wireless buildings” by the end of 2005.

Our IT managers are experimenting with alternative voice technologies and services to find the most cost-effective methods of providing mobile voice services on and off Intel campuses.

Reliable, enterprise-quality wireless voice will still be an issue in some locations, so we plan to deploy dual- or tri-mode mobile phones. In the event of a wireless network outage—or as our employees move out of campus range—our mobile phones can fall back on a second transmission method.

In addition, we'll also investigate the value of emerging low-cost alternatives to voice service, such as text messaging and PDA update technologies.

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