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**Making a Better Bluetooth**

By Robert L. Scheier  
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**Road Map**

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The first generation of products that use Bluetooth, the short-range wireless data transfer protocol, are **already in users' hands** in the form of notebook PCs, PDAs and cellular phones, not to mention wireless headsets, keyboards and mice.

Bluetooth can transmit data at a rate of 1Mbit per second (and at 2Mbits per second in the upcoming second version) at a range of up to 10 meters. But for Bluetooth to gain the prominence of its namesake (Harald Bluetooth, a tenth-century king of Denmark) vendors will **have to make it easier to use, as well as boost the speed** of the Bluetooth connection.

Microsoft is helping peripherals vendors and OEMs do just that by offering new APIs (application programming interfaces) that allow device manufacturers and independent software vendors (ISVs) to create synchronization applications that eliminate the need for users to manually troubleshoot their Bluetooth connections. This will help make Bluetooth easy enough to use that it can **replace cumbersome cables** to synchronize data between cell phones and PDAs to PCs running **Microsoft® Windows® XP** . It will also allow computer users to unclutter their offices by using wireless keyboards, mice and music headsets.

**Bluetooth Basics**

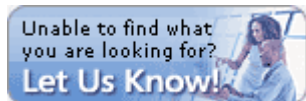
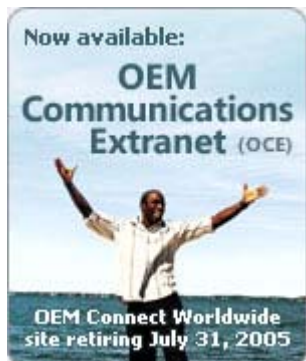
Bluetooth has received less market attention than has Wi-Fi, the protocol that allows consumers and businesses to deploy wireless local-area networks that link computers to the Internet. Bluetooth, by contrast, was **developed for data transfers specifically between a PC and its peripherals**, or between a PC and handheld devices such as cell phones or PDAs.

Bluetooth has entered the market quietly, offered as a low-cost connectivity option built into a variety of consumer devices. That installed base has grown quietly, but impressively, with market research firm In-Stat/MDR predicting the number of **Bluetooth chipsets doubled over the previous year's shipments** in both 2003 and 2004, reaching 146 million units last year.

Each of those chipsets represent a Bluetooth-enabled device and thus -- in theory -- a potential Bluetooth user. But actual Bluetooth usage has been held back in part because it is so difficult to "pair" and configure a Bluetooth device. "The Bluetooth device pairing

**Bluetooth at a Glance**

- ▶ [Short-range wireless cable replacement technology](#)
- ▶ [Operates in the same 2.45 GHz band as 802.11x wireless local area networks](#)
- ▶ [Bluetooth 1.1 and 1.2 has a 1Mbit per second](#)



experience is not something I would call user friendly," says Vatsal Bhardwaj, Bluetooth Program Manager at Microsoft. "Microsoft is currently looking at alternative technologies to **simplify the pairing experience for users.**"



The other aspect holding back the use of Bluetooth-enabled handheld devices with PCs is **difficulty in setting up the software that synchronizes data** between the two. "A user has to manually go in and do a bunch of work," says Bhardwaj, "such as specifying which COM port on the client system will be used to accept the Bluetooth connection."

- transfer rate, rising to 2-3 Mbits per second in Bluetooth 2.0
- ▶ Maximum range of 30 feet
- ▶ First used to connect wireless peripherals to PCs; now increasingly used to transfer data from cell phones, PDAs and other handheld devices to PCs
- ▶ Emerging trend: Use of Bluetooth Audio headset with the PC for VoIP calls, listening to music, etc.

Source: Microsoft Corp.

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### Taking Corrective Action

To provide the needed ease of use to Bluetooth users, device manufacturers and ISVs must develop more sophisticated synchronization capabilities and support for more of the "profiles" that define what is required to carry out specific functions within Bluetooth. In [Windows® XP Service Pack 2 \(SP2\)](#)  and [Windows® XP Professional x64 Edition](#) , Microsoft provided enough APIs (application programming interfaces) to allow device makers and ISVs to **support basic Bluetooth profiles and synchronization** functions.

But now Microsoft is making available native Bluetooth APIs that allow device manufacturers and ISVs to write synchronization software that **takes the burden off the user in establishing and configuring Bluetooth connections**. It is also examining ways to simplify other steps required to "pair" a Bluetooth device with a PC, such as the exchange of PINs (personal identification numbers) used to authenticate Bluetooth devices with the user's PC.

Microsoft is looking at providing more extensibility in the Bluetooth stack to allow device vendors and ISVs to **develop additional and more specialized profiles for new devices**. To create and support specialized profiles, they can use the Device ID feature, which will allow Windows to identify a device and load specialized profiles for it.

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### The Road Ahead

The Enhanced Data Rate (EDR) upgrade to the Bluetooth specification will **boost data transfer speeds to 2-3Mbits per second**, while reducing power consumption for input devices such as keyboards and mice by about half.

EDR will also address the need for Bluetooth Stereo Audio profiles to support stereo audio headsets, which often need much more bandwidth than other profiles. Improvements in the current Synchronous Connection (SCO) specification to add support for Enhanced Synchronous Connection (e/SCO) will also **greatly improve the user experience**.

SCO is required for any use of voice, hands-free or headset devices, while eSCO adds support for the retransmission of data packets, which improve the reliability and quality of sound transmission. eSCO also allows for the use of a **greater variety of the audio codecs** used to

#### To-Dos for Device Manufacturers and ISVs

- ▶ Evaluate and use the Windows socket APIs to write easier-to-use synchronization applications
- ▶ Support variable PINs in Bluetooth devices,

compress and decompress audio.

Improved bandwidth is one capability that will come in handy as consumers begin to adopt stereo **Bluetooth headphones that can be used for listening to music**, as well as making phone calls. Such devices allow a user to multitask, says Joyce Putscher, director of the Converging Markets and Technologies Group at In-Stat/MDR, "such as making mobile phone calls and listening to MP3 music from a laptop or other source."

- ▶ whenever possible, to improve security
- ▶ Review the QoS (quality of service) specifications from the Bluetooth SIG and ensure they understand how QoS will affect their device design
- ▶ Implement Device ID to develop vendor-specific Bluetooth applications

Source: Microsoft Corp.

To provide such multitasking along with a quality listening experience, **vendors will also need to provide QoS features** that will give audio traffic the priority it needs to avoid drop-outs and other quality problems. Microsoft is working with other members of the Bluetooth SIG (special interest group) to create a QoS specification.

Windows XP SP2 already supports a number of other Bluetooth functions. These include the ability to link to input devices such as keyboards and mice; the ability to use a handheld device such as a cell phone to access the Internet and transfer e-mail and other files to the PC; and for printing to Bluetooth-enabled printers. All of the **features currently supported in Windows XP SP2 will also be supported in Windows XP Professional x64 Edition**, which is scheduled to ship in the first half of 2005.

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### Security Enhancements

As more Bluetooth-enabled devices have reached the market, **hackers have been finding ways to eavesdrop on the connection** to either steal information or infect the Bluetooth systems with malware. Windows XP SP2, for example, ships with its Bluetooth "discovery" feature turned off by default. "It doesn't say 'I'm here' unless you specifically want your PC to be discovered" by other Bluetooth-enabled devices, says Microsoft's Bhardwaj. Microsoft has also disabled Bluetooth's file-acceptance capabilities and its ability to accept more than one file at a time unless, again, the user specifically enables those features.


"**Security is one area where there is 'low-hanging fruit'** where a device manufacturer or ISV can make great improvements for the user," he says. One is making sure a device supports authentication through the use of PINs (personal identification numbers) which are the "shared secret" shared between two Bluetooth devices.

Often, device makers choose a single PIN in all their devices. For example, "0000" and "1234" are the most popular choice for headset devices. This makes it **easier for an attacker to guess a PIN** and launch an attack. A manufacturer can greatly increase the security of their devices by using a slightly different PIN for each Bluetooth device.

With security and new functionality mind, Microsoft is looking to make early investments in emerging new trends such as Bluetooth audio and EDR to support the next wave of Bluetooth-enabled devices. Meanwhile, device makers can help **ensure their devices are interoperable** with future Microsoft operating systems by communicating their plans and submitting the devices to Microsoft for testing.

"What the manufacturers need to do is make sure the Bluetooth devices they are going to make for Windows work reasonably well," sums up analyst Michael Cherry at Directions on Microsoft, a Kirkland, Wash. consulting firm. "If the goal is to simplify how people connect peripherals, **it has to**

**be faultless in its operation.** It has to work the first time, and it has to work every time."

To help make that happen, **Microsoft is offering OEMs and Independent Software Vendors (ISVs) the tools** to deliver the easy connectivity that will driver wider adoption -- and wider use -- of tomorrow's Bluetooth-enabled devices. 

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### For More Information

[Microsoft Developers Network: Overview of Bluetooth SDK](#)

[Microsoft Developers Network: Managing Bluetooth Devices and Services](#)

[Native Bluetooth APIs for writing synchronization software](#)

[General information about Microsoft support for wireless networking](#)


[Official Website of the Bluetooth SIG \(Special Interest Group\)](#)

[To provide general Bluetooth feedback to Microsoft](#)

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