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Wireless VoIP: The Next Step in the Communications Evolution

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“Wi-Fi” wireless data links and increasingly powerful PDA devices are triggering a new phase of growth in Internet telephony by bringing real-time connectivity to portable, instant-on devices. With delivery of Voice-over-IP (VoIP) services on portable computing devices, enterprise users can now take an important step in fulfilling the promise of converged data and voice services. Here we review one of the first PDAs to deliver VPN access, shared enterprise resources, and robust telephony capability in a single device, using a Wi-Fi VoIP system.

Pocket Presence, which first brought telephony features to PDAs using GSM/GPRS cellular connectivity, ported its proven application suite for use on 802.11b wireless networks earlier this year. To make the jump to packet-based connectivity, the company collaborated with Global IP Sound, a provider of sound processing solutions designed specifically to meet the challenges of real-time communications over packet networks. The device integrates wireless VoIP telephony on a Microsoft Pocket PC 2002 PDA, providing anytime, anywhere access to both data and voice connections.

As *Internet Telephony* noted in July [<http://www.tmcnet.com/it/0702/0702.ms.htm>], mobile voice/data solutions will fill an important role in the evolution of enterprise communications. Cutting the cord that tethers mobile professionals to desktop voice and data applications promises tremendous gains in efficiency. And with the growing number of wireless hot spots inside and outside of a company’s managed network, the infrastructure to support fully integrated voice access is rapidly coming into place.

To truly replace the standard office phone, system developers have to meet several concurrent goals:

1. Telephony features must match, or preferably exceed, the capability of conventional phones.
2. The device must be simple to use. The truth is, the traditional phone does not have a friendly user interface, but it has become second nature to nearly every resident of the western world.
3. Sound quality must be at least equal to the quality of traditional wired-line calls. The nature of IP communications, compounded by the “noisiness” of wireless connectivity, makes this a particularly challenging task.
4. It must be easy to deploy. To use a traditional phone, one must merely plug the cord into a wall jack and it’s ready for use – true plug-and-play. It must be equally simple to deploy VoIP phones.

Pocket Presence took the first steps in creating an effective wireless voice solution with its Running Voice GSM, a full-featured telephony application designed for the growing number of PDAs with Bluetooth or GSM cellular capability. To bring this capability to wireless IP platforms, it was necessary to find a solution to the technical issues created by wireless LAN connectivity. In a WLAN environment, client devices have to handle many of the call set-up and management issues that are typically handled by cell phone service provider infrastructure. This increases the challenges faced in implementing an effective Wi-Fi voice system.

Inherent packet loss issues encountered in IP applications, which are easily managed in data applications, can reduce the quality of voice calls below acceptable levels. Voice communication is real-time, and dropped or excessively delayed packets result in unsatisfactory voice quality. These problems are accentuated in a wireless network. In addition, when a caller is roaming between hot spots (typical user behavior in an enterprise), the hand over of a call to the next available network node causes delayed and lost packets. These problems are addressed by Global IP Sound's SoundWare™ embedded software suite.

The two companies collaborated to integrate the core Running Voice telephony application with the GIPS VoiceEngine™, which is designed to handle all voice-related tasks for VoIP soft clients in PC or PDA environments. Various Pocket PC 2002 devices were used as demonstration platforms. GIPS' technology addresses the WLAN challenges, in part, by reducing inter-packet dependencies, so that accurate sound can be reconstructed even when a large percentage of packets are delayed or lost in transmission.

Since real-time capabilities, memory, and processor power are limited on Pocket PC platforms, achieving consistent real-time performance is particularly challenging. The integrated solution successfully reduced delay rates to less than 150 ms, compared to observed delay rates of 500 ms to 1 second in some VoIP PDA products. Clock drift between sending and receiving systems, another cause of distortion in VoIP applications, is tightly controlled. Finally, a wideband codec is implemented to provide more natural sound.

While actual voice processing is handled by the VoiceEngine, the Running Voice IP application manages call handling and provides a rich telephony feature set. The Professional version of the application uses the standardized SIP call setup protocol [RFC 3261], which allows the client to be used with existing VoIP infrastructure and PSTN gateways. A "lightweight" version of the product uses a simplified call setup protocol, enabling a straightforward and inexpensive deployment with a minimum configuration effort. The lightweight client is ideal for organizations that want to evaluate wireless VoIP.

The successful integration of VoIP capability in mobile, Pocket PC 2002 systems represents a leap forward in converged data and voice. It is a truly seamless application, with both data and voice packets transmitted over the same network.

Extended systems, which can utilize the already proven hybrid PDA/GSM cellular system, can support the voice connectivity features of the device beyond the range of Wi-Fi hot spots. This is a significant benefit for users, who can adopt a single communications and data access tool to replace today's separate cell phone and PDA.

The history and rapid evolution of both cellular phone and portable computing technologies indicates that the power of mobility will drive users toward rapid adoption of unwired technology. Will Strauss, the noted market researcher who has studied developments in the telecom infrastructure for nearly 20 years, forecast [<http://www.fwdconcepts.com/Pages/press35.htm>] that wireless connectivity via cellular, WLAN and wireless local loop applications will constitute the largest VoIP market by 2006. Mr. Strauss has also described the Running Voice IP demonstration on a Compaq iPAQ as "the best wireless IP phone I have ever used."

So what's next for Internet telephony? Clearly, the integration of PDA systems and wireless networking marks the next step in the evolution of computing in the enterprise. It is time to cut the cord that binds people to desks.

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