sumer devices that makes him quite a star among his friends. While he is always connected to the outside world through these devices, he can't get this multitude of devices to exchange data between themselves, despite being USB enabled. For example he cannot transfer songs from his mobile phone to his PDA; he cannot even play them on his jukebox. He can neither share the party photos taken on his digital camera with his friends nor can he print them on his photo printer without connecting the two to a common PC. Sam is caught in what the geekdom calls an interconnect void—a fearful world. **By G.P. Vinay Babu**

The Anywhere USB: Are You Connected?

Enter USB-OTG

Today, an increasing number of mobile consumer electronics products—portable digital assistants (PDAs), mobile phones, digital cameras, portable storage devices and so on—use the USB interface to exchange data with host PCs. With increased necessity to use many devices on the move, interconnectivity between these devices without the intermediary PC has assumed greater significance. The traditional USB not geared to meet this mobility challenge, the USB On-The-Go has emerged as a powerful interconnectivity standard for the future.

OTG: The Anywhere USB

USB has been a grand success thanks to its price, performance and reliability. Moreover, it has delivered on its promise of providing a 'plug-and-play' and daisy chaining capabilities for several devices. However, as the number of portable devices increase, there is a growing need to connect them between each rather than via a PC middleman. There will be an estimated 1 billion USB-enabled devices by the end of this year. If these devices cannot exchange data between themselves, then there will be a severe limitation on the growth of mobile devices.

OTG addresses these challenges and much more. With its capability to connect any device to any other device at any place in the near future, OTG offers the much-needed panacea for mobile interconnectivity woes.

Moreover, as mobile devices increase in number, sophistication, and portability interconnectivity between these devices is assuming greater importance. For example: Many USB digital cameras can download data to a PC-based application, but cannot connect directly to a USB printer or CD burner to print or store the photos. Some of these data exchange requirements are met today with removable memory devices, a viable

quate storage for a large number of device drivers and be capable of sourcing a large current. For many portable and almost all mobile devices, it is neither practical nor necessary to support these features.

USB ON-THE-GO (OTG)

The OTG is a supplement to USB specifications. It extends the USB standard to enable point-to-point communication between two USB devices: one OTG device and another OTG or traditional USB device. Because the two devices still maintain the roles of host and peripheral, OTG point-to-point communication is not the same as peer-to-peer. Unlike traditional USB, OTG allows only one peripheral at a time to be connected to the device acting as host. OTG devices do support USB hubs—a traditional way of enabling multiple USB peripherals to share a single USB host connection. However, some OTG functionality such as swapping host/peripheral roles and peripheral session requests are not supported across today's USB hubs.

How It All Began

In 1994, seven core companies defined USB as a universal, simple interface between phones and computers. Once defining the specification was in process, these original participants formed the USB Implementers Forum (USB-IF), which currently boasts more than 1,000 members. Now known as The USB-IF, Inc., the group's board of directors comprises representatives from Agere Systems, Hewlett-Packard Company, Intel Corporation, Microsoft Corporation, NEC Corporation and Philips.

Since the birth of USB, everything in the world has shrunk. Computers have become much smaller, more portable, and more pervasive. Desktop PCs have given way to notebook PCs, portable PCs and now palmtop PCs. Camcorders have reduced in size to fit the palm of a hand. Other portable consumer electronic devices—MP3, digital recorders, digital cameras, and photo printers—are now available, requiring a much more robust interface to perform such functions as music and photo file downloads. Smaller and portable devices meant that traditional USB alone couldn't handle the interconnect requirements between these devices. That's how the OTG supplement was defined.

Competing Technologies

There are several competing technologies vying for the same market pie as USB OTG in the networking space. These include both wired and wireless interfaces. The popular wired networking technologies include:

include:

- Infrared (IR)
- IEEE 802.11x (wireless Ethernet)
- Bluetooth

There is no doubt that USB OTG offers several advantages over many other interfaces; however, it remains to be seen how USB OTG will coexist with the other interfaces as they all compete for the limited real estate of the small, mobile consumer electronic devices.

Factors Affecting USB OTG

OTG has a huge potential to lead the interconnectivity market with many factors going in its favor. However, people's preferences depend on several parameters including the availability, reliability and price/performance.

Positive Factors

USB leads the way: With an estimated one billion USB connectors installed today, USB OTG can make use of this large presence. The experience of the USB-IF has helped USB OTG developers to bring products to market more quickly. USB OTG also enjoys the backing of the community of USB-IF member companies that

million pieces soon. Many users of consumer electronic products upgrade their devices more often than PC equipment, as new feature-rich, more stylish devices are introduced. It is expected that USB OTG will be included in Windows and other operating systems soon

Negative Factors

Mobile products will be one of the fastest growing product segments. To be truly mobile, however, consumers will prefer wireless connections in most cases, except when power and high-speed connectivity is needed. In deciding on a technology, the consumer will be subject to tradeoffs, between level of convenience; wired versus wireless, acceptable speed for certain connections, and availability of services in certain locations.

Future: OTG Gets Going

The economic and technological indicators suggest a huge demand for USB OTG products in the next five years. The major factors that drive the OTG demand would be the portability of several consumer devices, including PCs and the obvious need to interconnect these disparate devices without the necessity of a PC. The rapid growth of mobile telephony market is sure to fuel the OTG growth in the coming years. "OTG is taking off in a big way in the cellphone market. Despite the limitations of power and choice of class drivers, OTG would be one of the most important technologies for the future", says Rajeev Mehtani, Director, Philips Semiconductors' Design Competence Centre in Bangalore. Almost all mobile consumer products would incorporate USB OTG in their future versions. Depending on the level of competition and penetration, the growth rate of OTG-enabled products is going to be either