On-The-Go: The Ubiquitous USB

After the successful development of USB peripheral device solutions (both hardware and software), the Interconnectivity Solutions Department (ISD) - part of the ReUse Technology Group (RTG) of the CTO organization - is now working on the development of an integrated solution for a dual-role USB On-The-Go (OTG) device. This will allow PS to tap into the lucrative future market for embedded USB-On-The-Go.
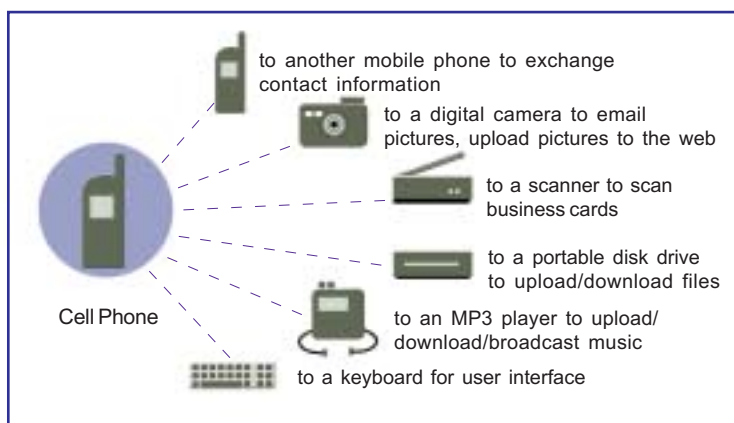
On-The-Go

There are more than a billion peripherals in the world today. However, these peripherals cannot communicate with each other, and have to go through an intermediate host (mostly a PC) to do so.

Not anymore.

With the emergence of Universal Serial Bus On-the-Go (OTG), a universal interconnectivity standard, peripheral devices no longer need an intermediate host to communicate with each other.

Consider, for instance, a cellphone with OTG interconnect. This can connect to another cellphone, link to a digital camera to upload pictures, or download files from a portable drive or the Internet. In effect, depending on the situation, the cellphone can act as a host or a device — thanks to OTG. OTG is based on two important protocols— the Host Negotiation Protocol (HNP), and the Session Request

to another mobile phone to exchange contact information

to a digital camera to email pictures, upload pictures to the web

to a scanner to scan business cards

to a portable disk drive to upload/download files

to an MP3 player to upload/download/broadcast music

to a keyboard for user interface

Cell Phone

Protocol (SRP). HNP allows dual-role devices to switch between host and device roles without changing cables. SRP enables the OTG product to work with portable, battery-powered consumer devices.

RTG-ISD and OTG

RTG-ISD is currently developing a dual-role OTG device (IP_3506) that combines the capabilities of both a host controller and a peripheral device. ISD already has full-function cores for both device and host in its portfolio. In combination with an interconnect glue logic and a comprehensive software stack, this forms the complete OTG solution. The IP_3506 can be configured either as a host or a device through the HNP.

OTG device uses the host stack when acting as a limited host and the device stack when acting as a device. The embedded stack developed by RTG-ISD handles this switching seamlessly, and is designed to transfer data in real time without dropping packets. A part of the stack — called an OTG control driver – handles the communication protocols like HNP and SRP and helps establish the initial host and peripheral assignments.

Development challenges

OTG development at the sub-micron level poses several challenges — technology challenges in making OTG work for different manufacturing processes like CMOS12 and CMOS18, design challenges in making the device suitable for low-power and low-gatecount portable peripheral devices, and integration challenges in making the analogue transceiver (ATX) work with the OTG device.

These challenges are effectively addressed at RTG-ISD, Bangalore, where the hardware and software groups are co-located. This unique synergy in the co-development of an integrated (hardware and software) USB solution will result in better efficiency and greater returns for PS in the future.

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