

Wireless USB

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Abstract - This paper aims to give an overview of Wireless USB. Wireless USB is a short-range, high-bandwidth wireless radio communication protocol created by the Wireless USB Promoter Group which intends to further increase the availability of general USB-based technologies. It is maintained by the WiMedia Alliance and (as of 2009) the current revision is 1.0, which was approved in 2005. Wireless USB is sometimes abbreviated as "WUSB".

Keywords: Wireless USB, Protocol, WUSB.

I. INTRODUCTION

WirelessUSB is a trademark of Cypress designed for short-range wireless connectivity. WirelessUSB enables PC

peripherals and point-to-point or multipoint-to-point

applications with the ability to replace the USB wire with a

low-cost, 2.4-GHz wireless solution. The WirelessUSB

system acts as a USB human interface device (HID)-class

device, so the wireless connectivity is transparent to the

designer at the operating system level.

WirelessUSB also

operates as a simple, cost-effective wireless link in a host of

other applications (non-USB). Cypress developed three

classes of devices: WirelessUSB LP, WirelessUSB LR,

WirelessUSB LS. WirelessUSB LP has been designed for low

power, long range (10m+), high data rate (1Mbps-GFSK or

250Kbps-DSSS) for applications like appliances, lighting,

automotive. WirelessUSB LS is a 10-meter transceiver with

applications like thermostats, switches and WirelessUSB LR

is a 50-meter transceiver widely used for keyboard and mouse.

The device considered in this work is the CYWM6935, of the

LR class. The module uses the ISM 2,4 GHz band and DSSS

(Direct Sequence Spread Spectrum) technology to improve

the immunity to the interferences, with GFSK modulation,

with a maximum bit rate of 62,5 Kbps.

II. USES

Wireless USB is used in game controllers, printers, scanners, digital cameras, portable media players, hard disk drives and USB flash drives. It is also suitable for transferring parallel video streams, using USB over ultra-wideband protocols.

III. DEVELOPMENT

The Wireless USB Promoter Group was formed in February 2004 to define the Wireless USB protocol. The group consists of Agere Systems (now merged with LSI Corporation), Hewlett-Packard, Intel, Microsoft, NEC Corporation, Philips, Staccato Communications, Alereon, Wisair and Samsung.

In May 2005, the Wireless USB Promoter Group announced version 1.0 of the Wireless USB specification.

In June 2006, five companies showed the first multi-vendor interoperability demonstration of Wireless USB. A laptop with an Intel host adapter using an Alereon PHY was used to transfer high

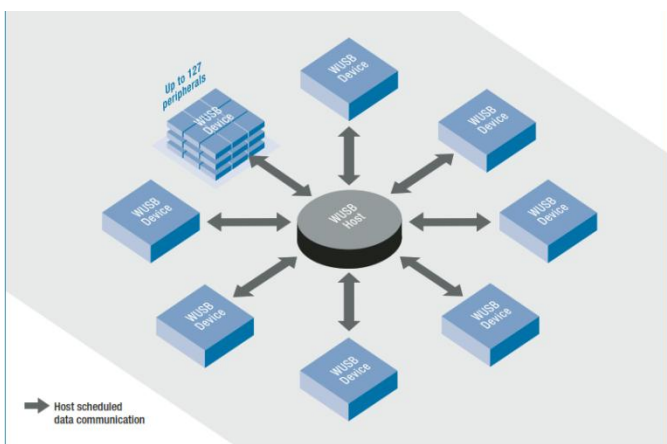
definition video from a Philips wireless semiconductor with a Staccato Communications PHY, all using Microsoft Windows XP drivers developed for Wireless USB.

In October 2006 the U.S. Federal Communications Commission (FCC) approved a Host Wire Adapter (HWA) and Device Wire Adapter (DWA) wireless USB products from WiQuest Communications for both outdoor and indoor use. The first retail product was shipped by IOGEAR using Alereon, Intel and NEC silicon in mid-2007. These products included embedded cards in the notebook PCs or adapters for those PCs that do not currently include Wireless USB. In 2008, a new Wireless USB Docking Station from Kensington was made available through Dell. Kensington released a Wireless USB universal docking station in August 2008 for wireless connectivity between a notebook PC and an external monitor, speakers, and existing wired USB peripherals. Imation announced Q408 availability of a new external Wireless HDD.

On March 16, 2009, the WiMedia Alliance announced transfer agreements for the WiMedia ultra-wideband (UWB) specifications. WiMedia transferred specifications, to the Bluetooth Special Interest Group (SIG), Wireless USB Promoter Group and the USB Implementers Forum. After the technology transfer the WiMedia Alliance ceased operations. A small, but significant, number of former WiMedia members had not and would not sign up to the necessary agreements for the intellectual property transfer. The Bluetooth group is now turning its attention from UWB to 60 GHz.

On September 29, 2010, version 1.1 of the Wireless USB specification was announced. It delivers several backwards-compatible improvements: UWB upper band support for frequencies 6 GHz and above, improved power management and consumption, and support for NFC and proximity based association.

IV. TECHNOLOGY REQUIREMENTS



1. A. Topology

The fundamental relationship in Wireless USB is the “hub-and-spoke” topology, as shown in Figure 1. The host initiates all the data traffic among the devices connected to it, allotting Timeslots and data bandwidth to each device connected. These relationships are referred to as clusters.

Fig. 1 Wireless USB Topology.

The connections are point-to-point and directed between the Wireless USB host and Wireless USB device. The main difference here from wired USB case is that there are no hubs present in the connection topology. The Wireless USB host can logically connect to a maximum of 127 Wireless USB devices.

Wireless USB clusters co-exist within an overlapping spatial environment with minimum interference, thus allowing for a number of other Wireless USB clusters to be present within

the same radio cell. In addition to providing wireless connectivity, Wireless USB will be backward compatible with wired USB and provide bridging to wired USB devices and hosts. A method will be required to enable the exchange of

data between clusters or devices not related to the same host. This method may be a second-level connection

between two hosts (i.e., a network) or some method

of transferring data between two clusters not managed

by the same host.

2. B. Performance

Wireless USB performance at launch will provide adequate

bandwidth to meet the requirements of a typical user

experience with wired connections. The 480 Mbps initial

target bandwidth is comparable to the current wired HiSpeed

USB standard. With 480 Mbps as the initial target, the Wireless USB specification will allow for generation steps

of data throughput. As the Ultra-Wideband (UWB) radio

Wireless USB is based on evolves and future process

Technologies take shape, bandwidth could exceed 1 Gbps.

This specification intends for Wireless USB to operate as

A wireless replacement with targeted usage models for cluster connectivity to the host and device-to-device connectivity at less than 10 meters.

3. C. Radio System Power and Power Management

Radio system power (power used only by the radio) will be

expected to meet the most stringent requirements, particularly

where mobile and handheld battery life is important. A

typical PDA uses between 250-400 mW without a radio

connection. Cellular phones typically use 200-300 mW

with the primary WAN radio. Adding a Wireless USB radio

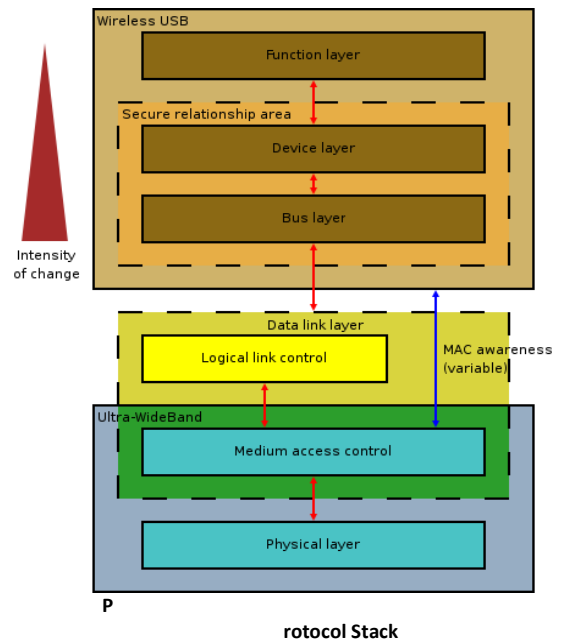
should not increase power requirements such that battery

life would be reduced more than by existing wireless technologies employed today. Battery-powered operation requires reasonable battery life – 3 to 5 days for highly mobile devices and several months for intermittently used devices like remote controls. Wireless USB based on Multiband OFDM Alliance (MBOA) radio will strive to meet this standard. The power target for Wireless USB radio will be less than 300 mW at introduction and drive to a target of 100 mW over time. Creative power management techniques will be used to preserve battery life. The radio, for instance, will sleep when possible and wake upon request. Power will also be conserved by stopping power-draining operations during idle periods.

V. PROTOCOL ARCHITECTURE

As mentioned, the USB model is preserved, and generally minor adjustments made to fit the specific needs of a wireless system. The changes are as follows, from top to bottom:

- The function layer only suffers minor changes to increase efficiency and support isochronism.



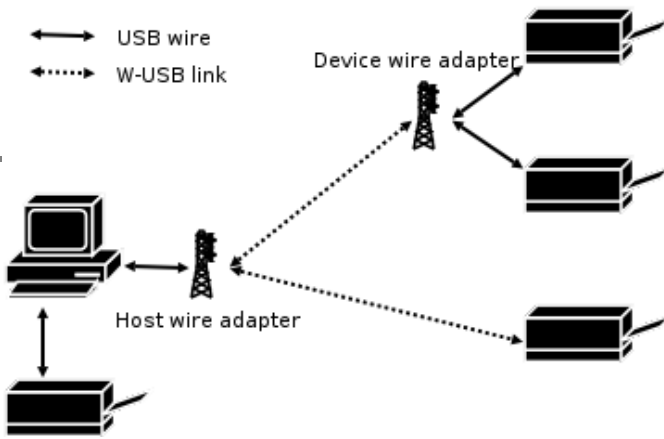
- The device layer includes wireless-oriented security and device management features.
- The bus layer does not change its functionality, but is substantially adapted for efficiency and security on wireless networks.

VI. COMPATIBILITY OPTIONS FOR OLDER HARDWARE

The WUSB architecture allows up to 127 devices to connect directly to a host. Because there are no wires or ports, there is no longer a need for hubs.

However, to facilitate migration from wired to wireless, WUSB introduced a new Device Wire Adapter (DWA) class. Sometimes referred to as a "WUSB hub", a DWA allows existing USB 2.0 devices to be used wirelessly with a WUSB host.

WUSB host capability can be added to existing PCs using a Host Wire Adapter (HWA). The HWA is a USB 2.0 device that attaches externally to a



desktop or laptop's USB port or internally to a laptop's MiniCard interface.

VII. CONNECTIVITY

W-USB interacts with wired USB via wire adapters. W-USB can form true USB systems, formed by a host, devices and interconnection support. It implements the USB hub-spoke model, in which up to 127 wireless devices can form point-to-point links (spokes) with the host (the hub). The host controller is unique in the system and is usually embedded in a working computer, though it could be connected to it through a simple USB connection, possibly wireless as well. Such a topology is similar to a star network (but all communications are strictly point-to-point, never between devices).

Fig. 3 W-USB interacts with wired USB via wire adapters.

In order to allow common wired USB devices to be connected, the specification defines device wire adapters. Likewise, hosts connect to W-USB systems through use of a host wire adapter. Even though the physical layer is based on Ultra-WideBand, W-USB devices have a fully compliant USB interface. The physical layer may support a wide range of transfer rates, of which three are defined as mandatorily supported: 53.3, 106.7 and 200 Mbit/s, all other possible UWB rates being optional for devices (hosts must support them all).

VIII. SECURITY AND DEVICE ASSOCIATION

Wireless USB security will be designed to deliver the same

level of security as wired USB. Connection-level security

between devices, for instance, will be designed to ensure

a device is associated and authenticated before operation

of the device is permitted. Higher levels of security involving

encryption will be implemented at the application level. An

important goal will be to ensure that processing overhead

supporting security does not impose noticeable performance impacts or device cost.

To facilitate device associations, the Wireless USB specification will include the following requirements.

- An easy way for consumers to connect Wireless USB devices and hosts (the focus of device connection or “pairing” will be simplicity and ease-of-use).
- Mutual authentication in device and host connections
- so that devices will have the opportunity to validate
- the host and the host will have the opportunity to validate the device.
- World class security as a standard and non-removable feature for all certified Wireless USB devices.

IX. CONCLUSION

In this paper, we have discussed about the Wireless USB Technology, its uses and development. We have also discussed various technology requirements, the protocol architecture, connectivity of W-USB with wired USB and how

the wired usb provides assures the same level of security as wired usb.

ACKNOWLEDGEMENT

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