Dordt University
Engineering 304, Microprocessor Interfacing

19/20

Problem Set #9, Spring 2020

Answers for the questions below can be found in the *Universal Serial Bus Specification* Revision 2.0 (also known as the "USB Standard"). The standard is available in hard-copy via the reserve collection at the Dordt Library. It is also available for free downloading from the Web. (A link is given on the Canvas homework page for this course.)

For each question below, provide an answer that is as complete as possible subject to the constraint that it is **less than 100 words.**

What is an **Isochronous Transfer**? (Section 5.6)

In non-USB environments, isochronous transfers have the general implication of constant-rate, error-tolerant transfers. In the USB environment, requesting an isochronus transfer type proves the requester with the following:

Guaranteed access to USB bandwidth latency
Guaranteed constant data rate through the pipe as long as data is provided to the pipe
In the case of a delivery failure due to error, no retrying of the attempt to deliver the data.

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While the USB isochronous transfer type is designed to support isochronous sources and destinations, it is not required that software using this transfer type actually be isochronous sources in order to use the transfer type. Section 5.12 presents more detail on special considerations for handling isochronous data on the USB.

What is a **Bulk Transfer**? (Section 5.8)

One of four USB transfer types. Bulk transfers are non-periodic, large bursty communications typically used for a transfer that can use any available bandwidth and can also be delayed until bandwidth is available. See also transfer type.

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Bulk transfers include error detection and retries.If the trans

How many **microframes** are there in a **frame**? (Section 8.4.3.1)

Eight

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What is **Bus Enumeration**? (Section 9.1.2)

The activity that identifies and assigns unique addresses to devices to a bus because the usb allows usb devices to attach or detach from the usb at any time, bus enumeration is an on-going activity for the USB System Software. Additionally, bus enumeration for the USB also includes the detection and processing of removals.

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What is **Dynamic Attachment and Removal**? (Section 9.2.1)

USB Devices may be attached and removed at any time. The hub that provides the attachment point or port is responsible for reporting any change in the state of the port. The host enables the hub port where the device is attached upon detection of an attachment, which also has the effect of resizing the device. A reset USB device has the following characteristics.

- Responds to the default USB device
- Is not configured
- Is not initially suspended

When a device is removed from a hub port, the hub disables the port where the device was attached and notifies the host of the removal.

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