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Wireless USB 1.1 Architecture Overview

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Agenda



- Wireless USB Current Status
- Wireless USB Additions/Modifications
 - Security
 - WiMedia Convergence
 - Protocol Enhancements
 - Power Efficiency Improvements
 - Wire Adapter Protocol Improvements
 - DRD Enhancements
- Association and Usability Update
- UWB Upper Band Support

Wireless USB: Next Steps



Current Solutions

- HWA (Host Wireless Adapter) Host
 - USB interface to PC
 - Embedded and dongle form factors
- DWA (Device Wireless Adapter)
 - Often found in a hub form factor



Solutions 2009

- WHCI (Wireless Host Controller Interface) Native Host
 - PCIe interface to PC
 - Embedded in desktops and notebooks
- Native Device
 - Cameras, Printers, Media Players, Etc.



Demo



How does it work?

- The ICGEAR Wireless USB to VGA Adapter kit instantly allows you to add a high resolution display using Wireless USB Technology.
- Simply install the driver software. Connect the USB adapter to your PC and the VGA adapter to your VGA monitor. You are ready to extend your desktop to another screen wirelessly.



- Update Security Chapter
 - Incorporate the latest errata
 - Align text with the currently supported association models and connection methods
- Explore additional requests in unauthenticated state
 - Provision to get bitmap image/device class before authentication using special descriptors
 - Usability WG discussions might lead to additional requests
- No new encryption schemes

WiMedia Convergence



- **Directed Beaconsing Devices**
 - Remove support for this feature from the specification
- **Non-Beaconsing Devices**
 - Remove support for this feature from the specification
- **Host Channel Reservation Policy**
 - Current policy supports 2 hosts working on the same channel
 - Looking at techniques to increase this to 4 hosts/channel
 - Restrict the number of unsafe MAS that a host can reserve
 - Define Safe for Bulk and Safe for Isoch reservations
 - Based on the WiMedia CSP

WiMedia Convergence (cont.)



- Clean up Self-Beaconing Devices
 - Remove
 - DN_MASAvailChange
 - GetStatus(DRP Availability)
 - SetWUSBData(DRPIE Info)
 - SetFeature(TX DRPIE)
- Define a host's private reservation as a Multicast reservation
- Define a WiMedia compliant device connection procedure
- Define a method of associating a Wireless USB device with its beacon
 - Define a New IE
 - Requires unique EUI-48 for devices
- Describing host support for 1.0 SBD's
 - Renamed "Assisted Beaconing Devices"

Protocol Enhancements



- Ability to inform the host of the number of packets an endpoint can send
- Bulk Transfer Updates
 - Transmit 3 blank W_{DT} -CTAs at the end of a transfer
- Control Transfer Updates
 - Add guidelines for device vendors on handling a retry or 2nd control transfer for control transfers without a data stage.
- Isochronous Transfer Updates
 - Removed False acknowledgement requirement
 - Remove the Discard IE
- Interrupt Transfer Updates
 - Added a way to declare an endpoint as periodic or notification
- Addition of Task IDs

Power Efficiency Improvements Host Side



- Currently devices have to poll to detect when the host is awake
 - Expand Channel Stop IE
 - Include precise wakeup time
 - Indicate sleep cycle
 - Add a preferred channel list
- Use Hibernation Anchor
 - Save even more power during channel stop
- Improve power efficiency on resume
- Locating a Sleeping Host
 - Device may miss a host because of hosts transmit infrequently

Power Efficiency Improvements Device Side



- Host Initiated Sleep
 - New IE provides devices with a specific duration of sleep
 - Devices accept or reject using notifications
- Remote Wakeup Changes
 - Allow hosts to optionally accept unencrypted wake notifications
- DNTS Scheduling
 - Scanning Aperture for DNTS being non-deterministic results in power wastage
 - Include Host Information IE and DNTS Slots in the first WUSB Reserved MAS in Zone 1 and Zone 15
- Low Power Notification and Power Info Probe
 - Ability to notify host of a low power condition
 - Add capability for a Host to query a device for extensive power/battery information

WA Protocol Issues



- Overhead of Transfer Requests/Results/Completion Notifications
 - MSD protocol example: 3 packets on the wire will be converted to 12 packets on the air
- Latency:
 - Due to overhead, increased latency per single transfer
 - Minimal support for Streaming
- Reduced Throughput
- Memory requirements for WA devices
- Interrupt endpoint support
 - Currently supported over Bulk => No QoS possible.

WA Protocol Improvements



- Eliminate Transfer Complete notification
 - Use Transfer Result polling instead
- Opportunistic aggregation
 - Transfer Request + OUT Transfer Data
 - Transfer Result + IN Transfer Data
 - Aggregation limited to over-the-air packet size
 - Padding to 4 byte boundary to simplify de-aggregation alignment
- Separate DWA Bulk IN endpoints for Transfer Result and Transfer Data
 - Facilitate pipelining + Streaming
 - Minimize latency for different streams of data, if separate endpoints are used
- Backward compatibility to WUSB 1.0 WA protocol
 - Alternate Interface Settings
 - Host configures DWA WAP versions to be used

WA Protocol Improvements



- Allow Dynamic Memory Allocation between RPIPEs by WA device
 - Add Dynamic Memory Allocation Capability in WA class descriptor
 - Driver may not allocate specific number of blocks per RPIPE, and rely on dynamic allocation
 - Increase significantly number of RPIPEs supported
 - Save re-assignment of RPIPEs overhead
- Define “Transparent RPIPE”
 - Data transfer is transparent to (Bulk OUT) or from (Bulk IN), no overhead of Transfer Request / Result
 - Routing of Data determined by RPIPE Descriptor
 - Add in RPIPE Descriptor “Transparent” type
 - Concept similar to Isochronous endpoint treatment

DRD Enhancements

Focus points



- Device <->Host bi-directional connection always established
 - Even though most usage scenarios require only one to be the host
- Role decision
 - Which device is the Host is not clear (Possible Role Collision)
 - Having the User decide which device should be the host is undesirable
 - Preferably done at association time
- New association model
 - Cable Based Association is not suited as it requires a cable
 - Numeric association may not suit DRD Devices with no display
 - NFC may be ideal for association
- Association assumes long term host-device relationship
 - P2P DRD connections should always be one time connections

Association and Usability Update



- New Association Methods
 - NFC
 - Long PIN association
- Support for multiple languages
 - Currently only English supported
- Connect to me
 - Devices are told to connect to a particular host
 - Identify the host before association
 - Explore a device handoff mechanism
- Friendly names
 - Currently Host/Device friendly names are available only after the association
 - Add capability to advertise the host/device friendly name before association
- Add the ability to identify the capabilities of a device before connection

UWB Upper Band Support



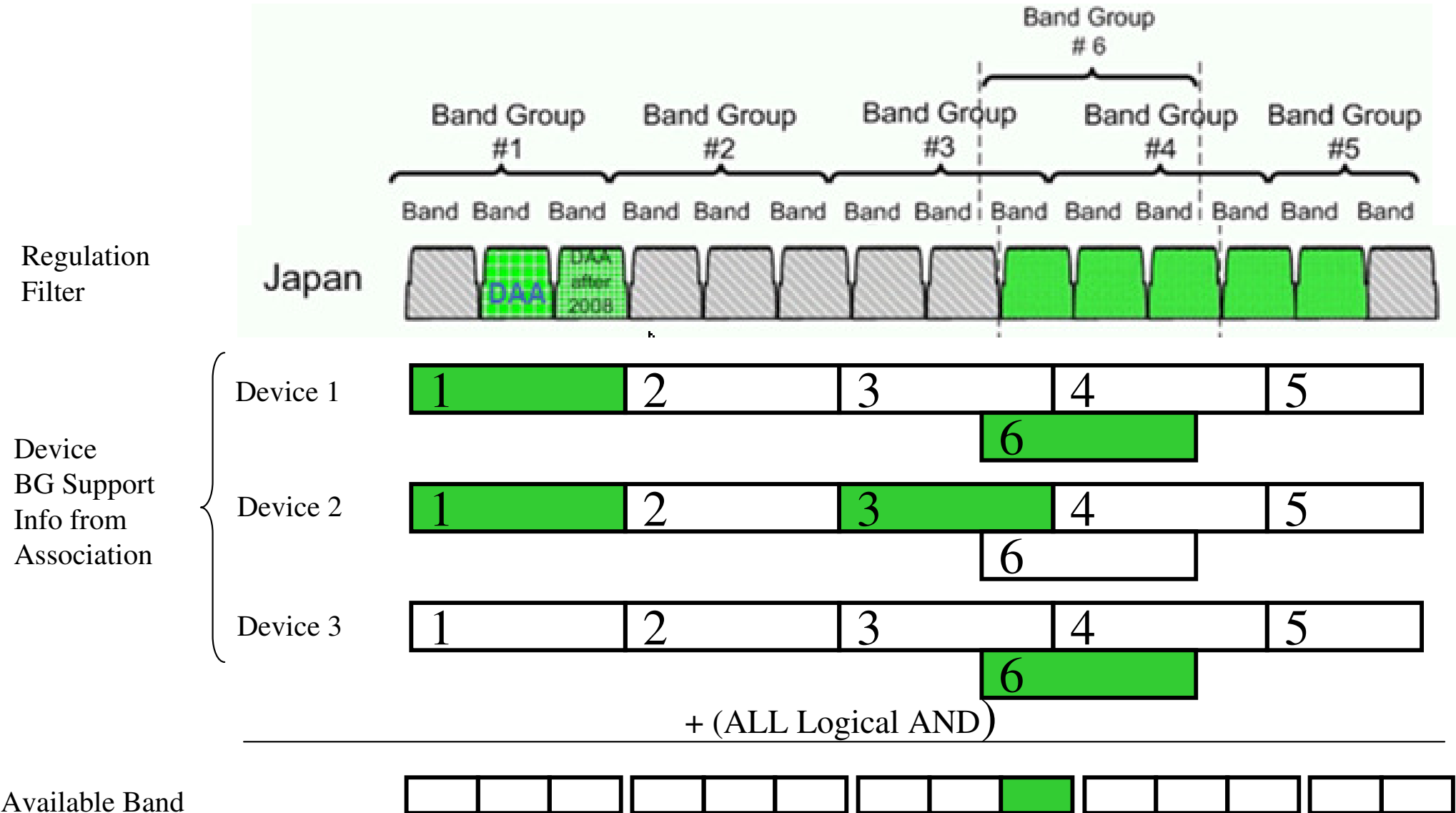
- Use only BG1, BG6/BG3
- Host: BG1 Mandatory, BG6/BG3 Mandatory
 - Compliance waiver for BG1-only support for next 12 months
- Embedded Host: BG1 Optional, BG6/BG3 Mandatory
 - Compliance waiver for BG1-only support for next 18 months
- Device: BG1 Option, BG6/BG3 Mandatory
 - HB-only device must support Cable Association
 - Compliance waiver for BG1-only support for next 18 months

Incompatibility Issues Solutions



- HB-only device tries to associate with system with LB-only host
 - Display message to the user
- HB-only device tries to associate with system with LB and HB support host and LB-only device already attached
 - Display message to the user suggesting to choose one of the band groups
 - Association Assist Application shows LB and HB group with Device description(s) for the user to choose
 - User can change operating band groups anytime
- Define a new Common Band Selection Logic
 - Best available channel
 - Keep current channel
 - Never change channel

Common Band Selection Logic



Summary



- Emerging Native Host and Devices in 2008
- Wireless USB Supports Great “Use Cases”
- Wireless USB Delivers Excellent Performance
- Wireless USB 1.1
 - Improved power efficiency
 - New association model
 - UWB Upper band support

Wireless USB 1.1 specification est. completed Q3'09