
From: David Sroka - C16440
Sent: Wednesday, July 23, 2014 5:53 PM MDT
To: Brigham Steele - C21902; Andrew Rogers - C15515; Don Perkins - C21824
Subject: RE: Debunking Unwired
Attachments: Unwired_03.pptx

Use this one instead.....clearer statements.

Dave

From: David Sroka - C16440
Sent: Wednesday, July 23, 2014 4:16 PM
To: Brigham Steele - C21902; Andrew Rogers - C15515; Don Perkins - C21824
Subject: RE: Debunking Unwired

Thanks for the inputs here is the updated version.

How should we use ?

- 1) Train FAEs on the issues for them to discuss with customer. Leave the ppt with the customer or not?
- 2) Send to the customers we just visited....and wait for responses/questions.....sure to create some sparks.
- 3) Send to sales and let them decide proper usage per customer; support accordingly
- 4) Other?

I think we had seriously disputed the concept so I think we are justified to send a response based upon what we heard/know/think. Also this is sure to draw out responses that will allow us to better understand the UnWired solution.

I would say 1 and 3 as my preferred approach.

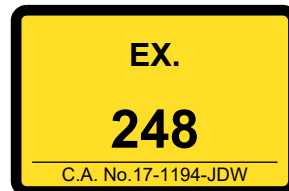
Dave

From: Brigham Steele - C21902
Sent: Wednesday, July 23, 2014 3:37 PM
To: Andrew Rogers - C15515; David Sroka - C16440; Don Perkins - C21824
Subject: RE: Debunking Unwired

More new slides, you may want to clean them up a little with pictures.

From: Andrew Rogers - C15515
Sent: Wednesday, July 23, 2014 11:37 AM
To: David Sroka - C16440; Don Perkins - C21824; Brigham Steele - C21902
Subject: RE: Debunking Unwired

Dave,



I made some minor edits to pages 4 and 5. Feel free to incorporate these into your deck or throw them out.

Regards,
Andrew

From: David Sroka - C16440
Sent: Wednesday, July 23, 2014 11:11 AM
To: Don Perkins - C21824; Andrew Rogers - C15515; Brigham Steele - C21902
Subject: RE: Debunking Unwired

Updated.

Dave

From: David Sroka - C16440
Sent: Wednesday, July 23, 2014 10:22 AM
To: Don Perkins - C21824; Andrew Rogers - C15515; Brigham Steele - C21902
Subject: Debunking Unwired

Here is what I have put together, appreciate thoughts/inputs.

Dave

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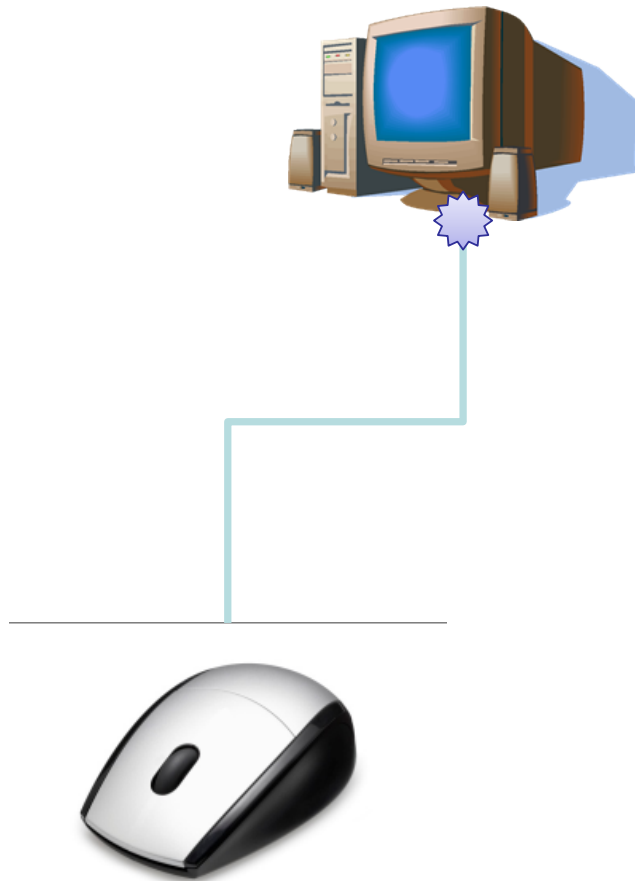
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USB Spoofing – Media Breakout Box and Carplay®

Implementations and Considerations



Standard USB Data Flow: Host



| Host Owns the Bus

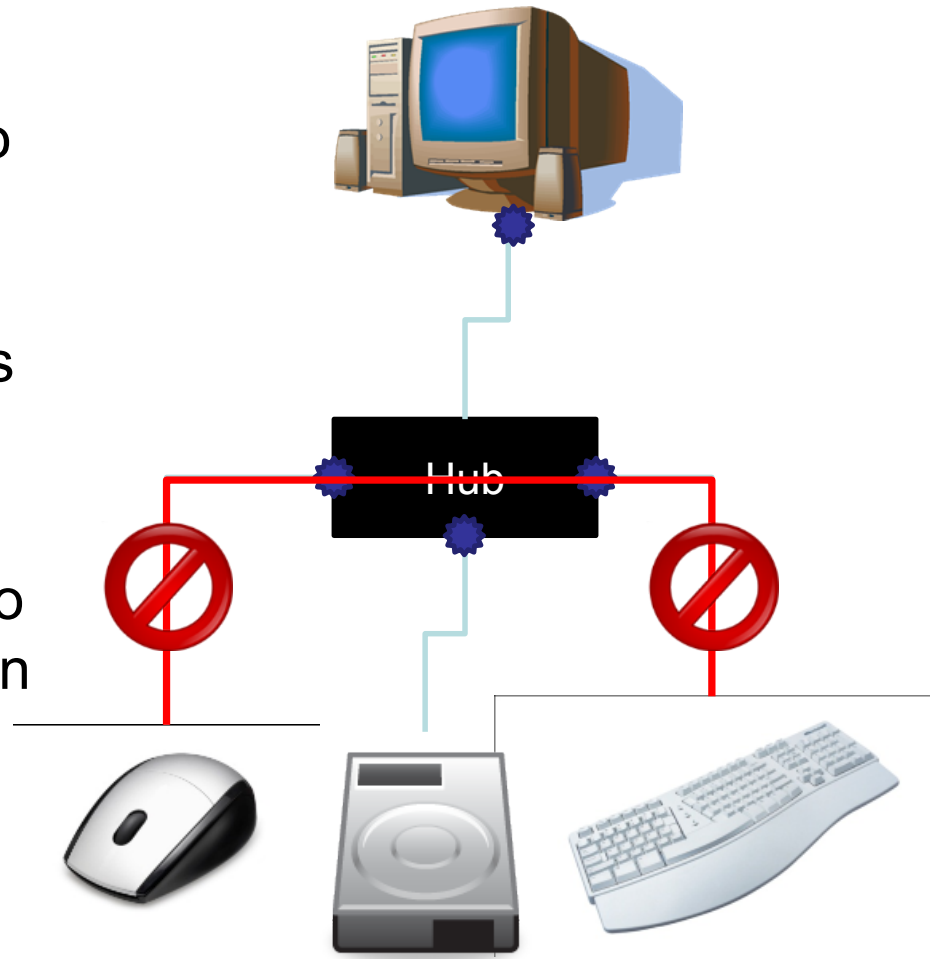
- | All data originates from Host
- | Device must respond to Host
- | Host can ignore the Device



Standard USB Data Flow: Hubs

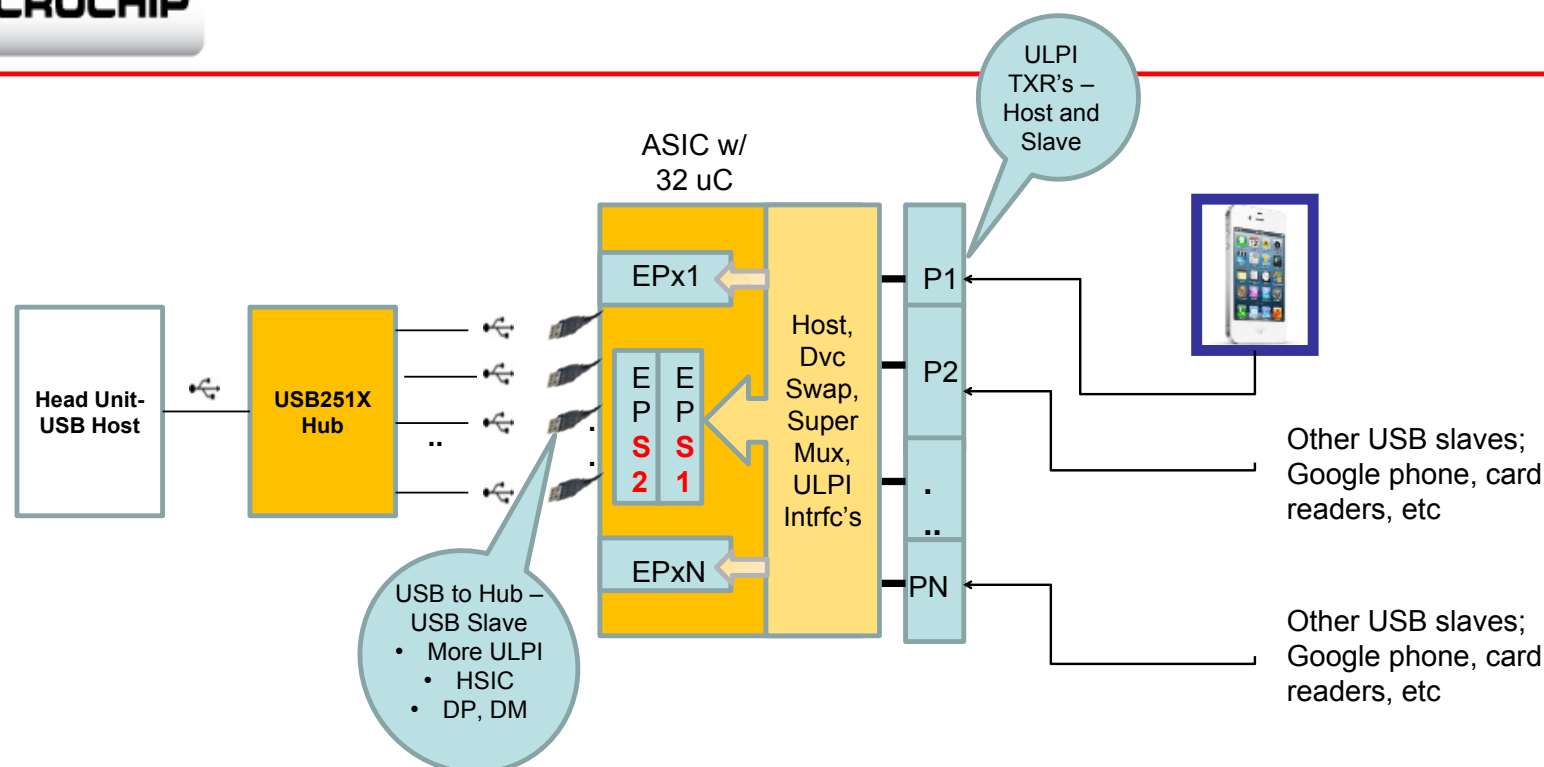
| Hubs

- | Allow more devices to connect to one Host
- | Repeat the Host commands to all ports
- | Translate HS signals to FS and LS
- | Do not allow Device to Device communication





BoB Alternative Approach



Consistent statements heard from multiple customers (Head and BoB makers):

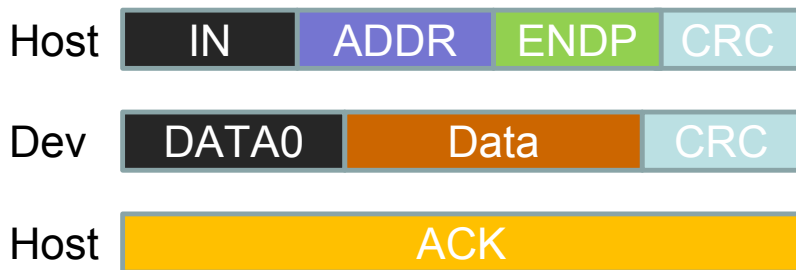
- I All user ports are Carplay® enabled
 - I iPhone begins as a USB device but switches to USB Host when entering Carplay ® mode.
 - I Note if the iPhone connects to a standard Hub, the architecture is flawed. Standard Hub downstream ports are always host s. Carplay requires port to be a device (ie. When iPhone is the host).
- I Head Unit is always a USB Host translates to two USB Host system
 - I All devices connected to other ports still enumerated and accessible to Head Unit (USB Host) while in CarPlay mode.
 - I Dedicated lane from iPhone to Head Unit requirement is violated.



“Simple” USB Commands

IN Transaction – Basic transfer of data (Video, Audio etc)

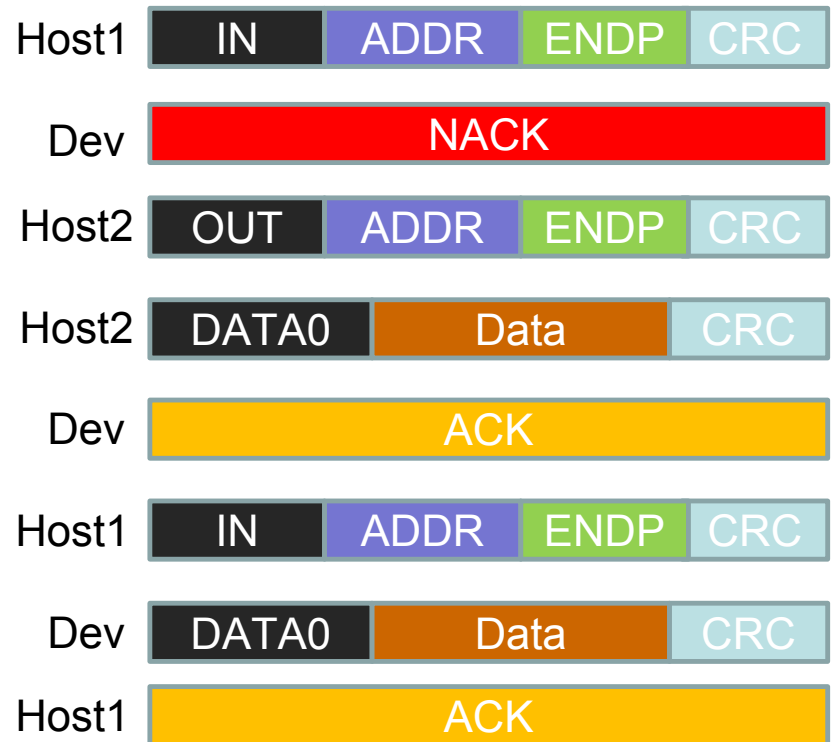
| Dedicated USB Lane



| Just one simple transaction.

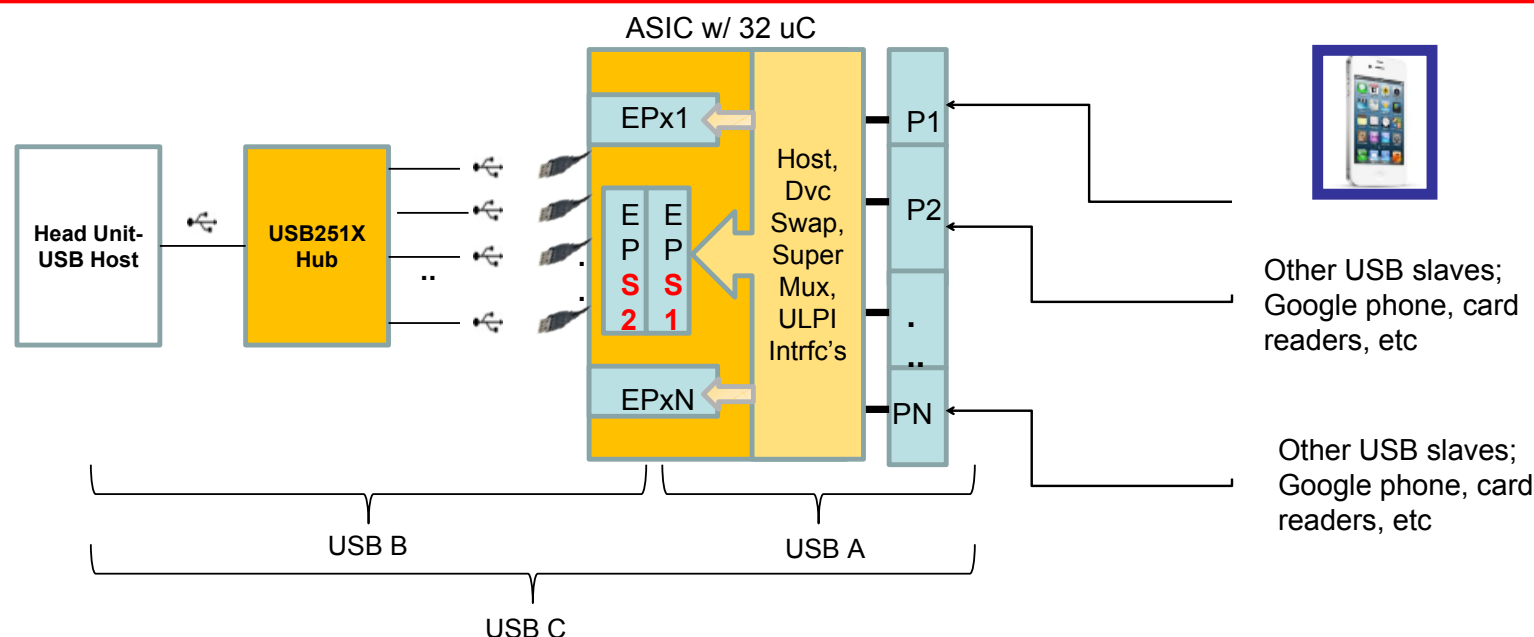
| High risk for error with 2 Hosts

| Two Host Solution





Carplay® - Considerations



This is a custom solution....not standard USB:

- | Carplay path will demonstrate degraded performance due to bridging delay and serial USB networks
- | Other USB devices (Google) will present to host faster and provide higher through-puts
- | Custom driver is necessitated....will it need field updates....can it cover entire USB solution space ?
- | When running composite apps at high bandwidth (video, isoc, etc) can time-outs occur between the two serial networks (HID, other?)
- | Host / device transaction swaps similar to Philips ISP1261, IP / indemnification issues?
- | Spoofing is similar to Man-in-the-Middle operation.....security impact ?
 - Allowed by Car Play specification ?
 - Car Play authentication?



More Dual Host Dangers

| Host 1

- | Video is high priority
- | Audio is medium priority
- | HID is lower priority
 - | Button
 - | Touch Screen

| Host 2

- | Video is high priority
- | **Mass Storage**
Requires long packets
- | Audio is medium priority
- | HID is low priority
 - | Button
 - | Touch Screen

Possibility of service mismatch as 2 hosts independently polling, executing device transactions. Host in head unit will dictate data-flow (polling of the four hub endpoints) and is impacted by system micro-controller operational bandwidth. But Apple Host dictating data-flow to spoof endpoints and may overflow buffers, incur time-outs if not serviced, and result in poor performance.



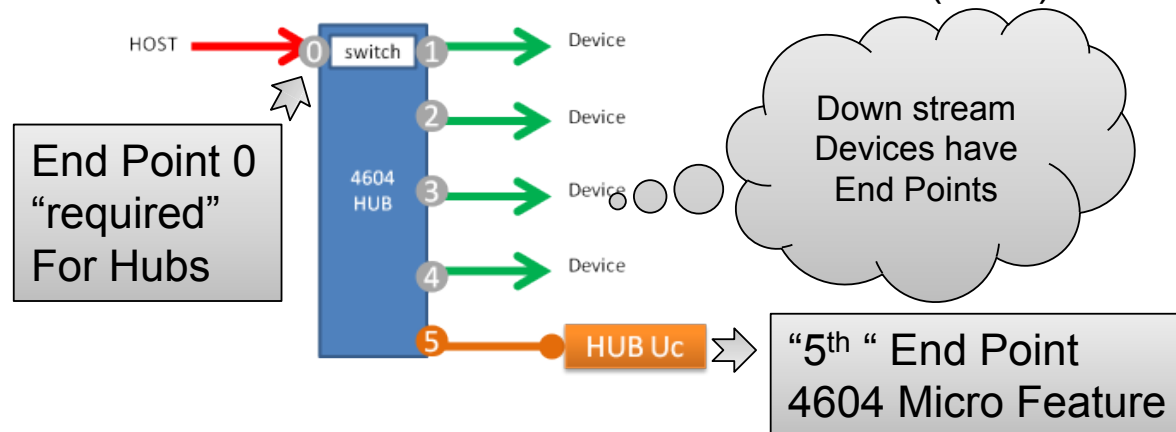
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USB2.0 Hub Controllers



Implementing with Compliant USB, Standard Topologies

- | **USB is a master slave topology**
 - | There can be only “one” Host at a time.
 - | There can be up to 127 devices
- | **Each device (or Hub) in the USB “Lane” has an End Point**
 - | An address for the Host to communicate directly with that device (or hub)
- | **Our USB4604 hub has multiple end points**
 - | Port 0 which is required by USB (Hub host facing port)
 - | **5th End Point** which is our Microcontroller device (UCH)





The USB2 Controller HUB (UCH2)

UCH2 = USB₂ Controller HUB

❑ What is a USB Controller Hub (UCH)?

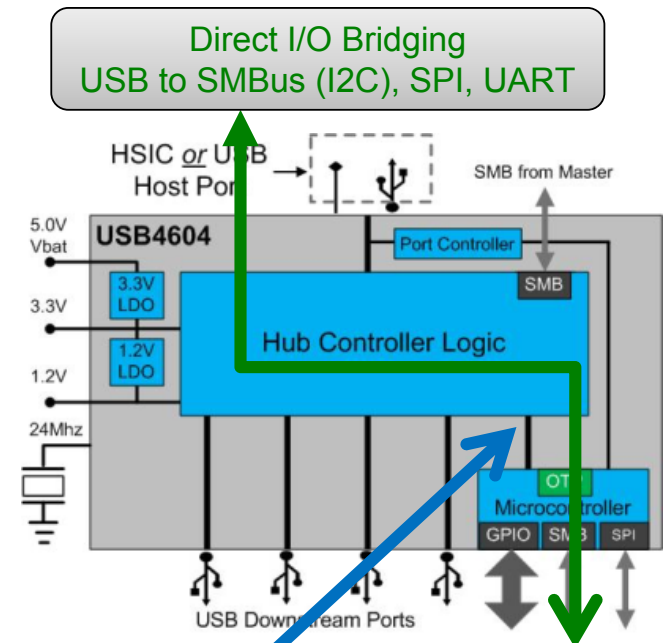
- ❑ USB HUB Function (2, 3, 4 port)
- ❑ And End Point with microcontroller
- ❑ OTP Flash support for configuration

❑ Embedded Microcontroller Functions

- ❑ HUB configuration during startup
- ❑ “OTP Flash” Configuration
- ❑ GPIO Bridging for HOST
- ❑ Executes custom features

❑ Features Enabled by Micro

- ❑ Enables “direct I/O bridging”
 - ❑ SMBus, GPIO, UART, SPI
- ❑ Allows DCP charging when host not present
- ❑ Allows customer specific functionality



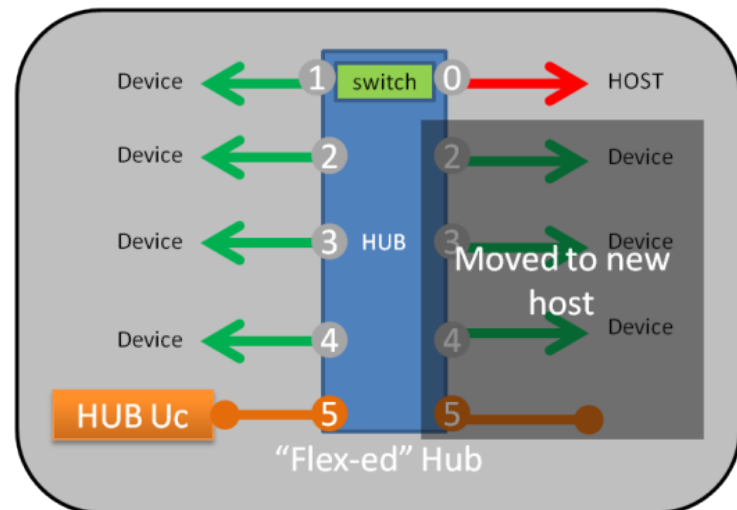
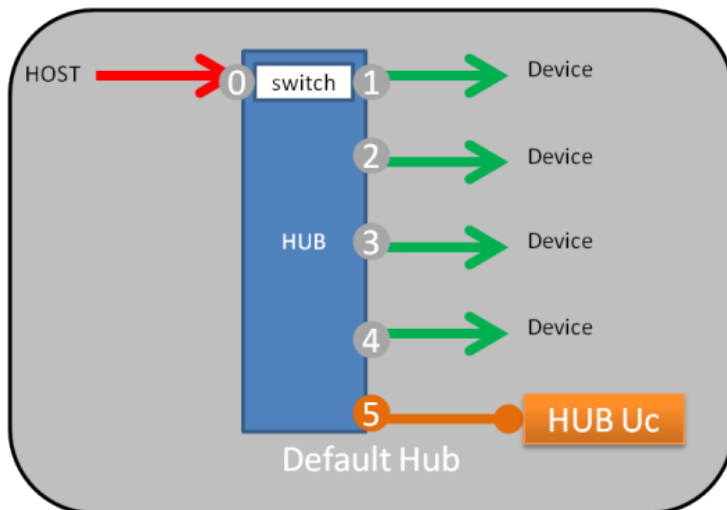
Microcontroller is “literally”
on 5th Port of the Hub
- RX and TX USB Packets





What is “Flex Connect”?

- | “Flex Connect” is a simple way to reverse the USB Lane
- | “Flex Connect” supports “role reversal” where one system wants to temporarily become the USB Host
- | Port 0 and Port 1 actually “switch” internally on the die
 - | Both Hubs pass USB Compliance
- | All devices will “move” to the “then current” Host

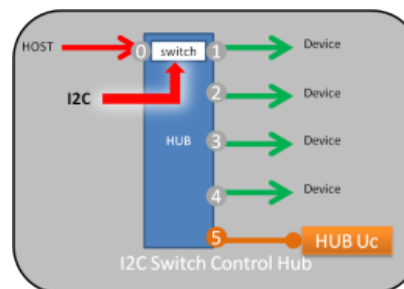




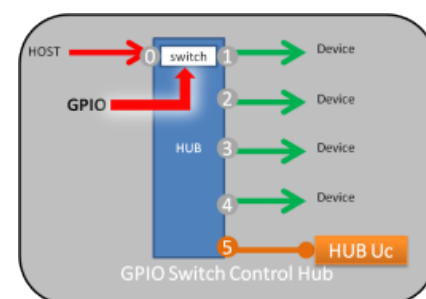
Controlling the “Switch”

- | Three ways

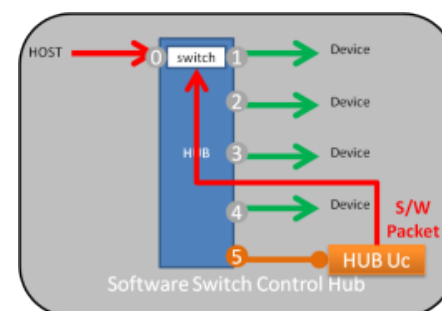
- | Using I2C lane from local SOC



- | Using GPIO from cable or local SOC



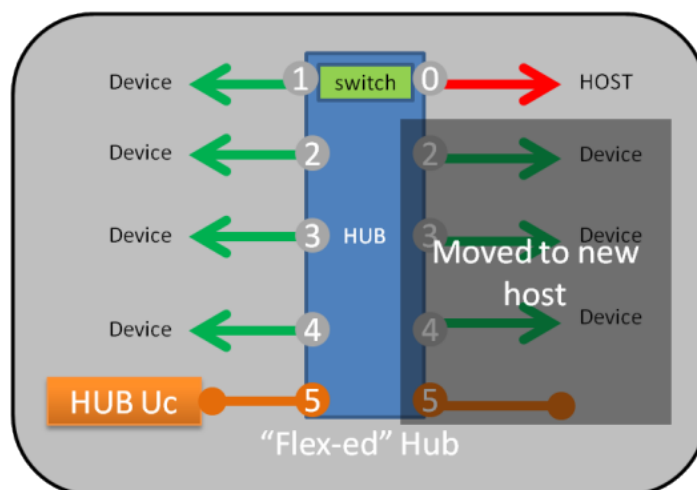
- | Using software and the “5th end point”





System Implications

- | When you switch - “all device ports” will switch to new host and re-enumerate
- | Host / SOC can set hub to “turn off” specific hub ports in the command word
- | Carplay® wants “exclusive” connectivity to head unit

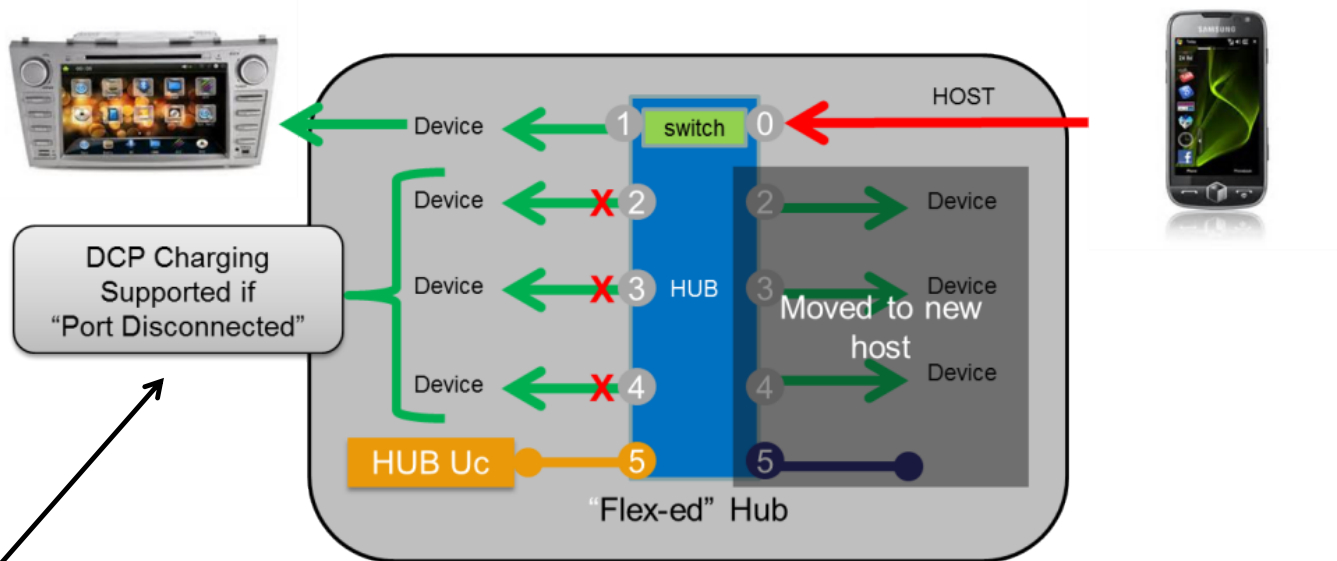




Advanced Concepts - PDC

| “Port Disconnect Charging”

- | When you “Flex” the hub the CMD word allows for hub ports to be disconnected from new host
- | What do you do with disconnected hub ports?



Charge your friends iPhone/iPad

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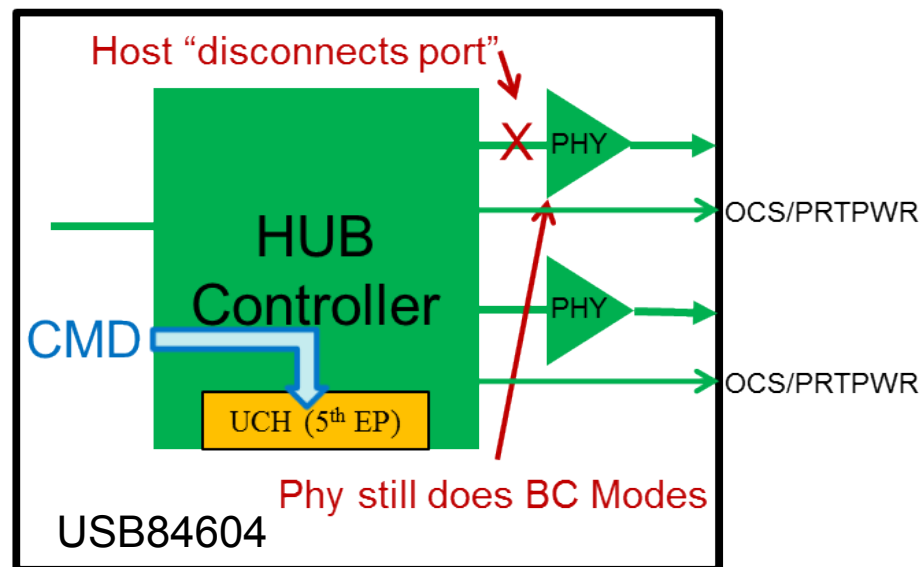
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“Port Disconnect Charging”

- I **USB84604/USB5734** Required to support “Port Disconnect Charging” (USB Controller Hub architecture)
- I “Any” downstream port can be **PDC** w/CMD word



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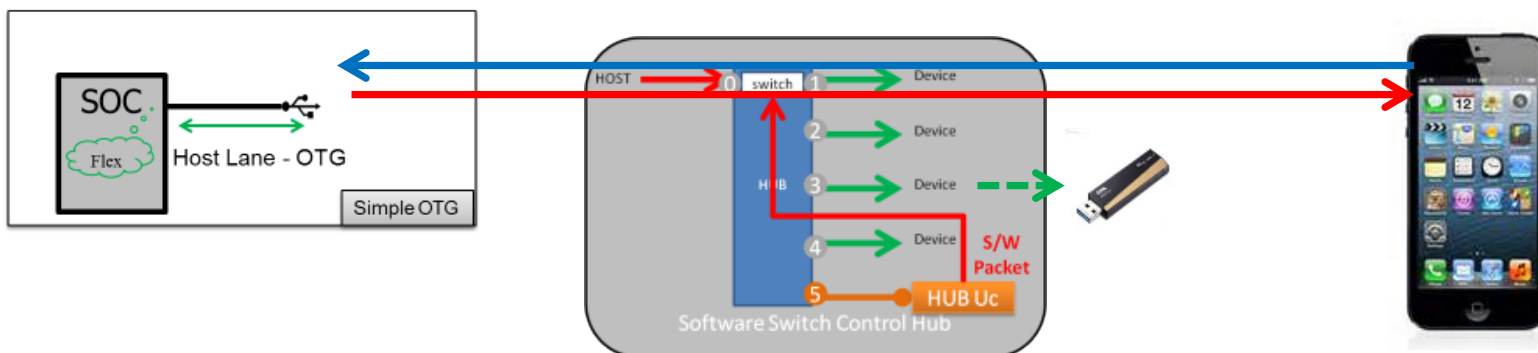
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Advanced Concepts - HDD

- | How do you “Un Flex” when Smart Phone is removed?
 - | USB4604 (even with Vbus always present) can detect the loss of “host” connection, we do this for battery charging applications
 - | 4604 micro will return to “non Flex-ed” and re-enumerate with host
 - | SOC must do the same
 - | Recommend VBus provided from the Head Unit to BoB
 - | Provides “Hostile Take Over” by Head Unit



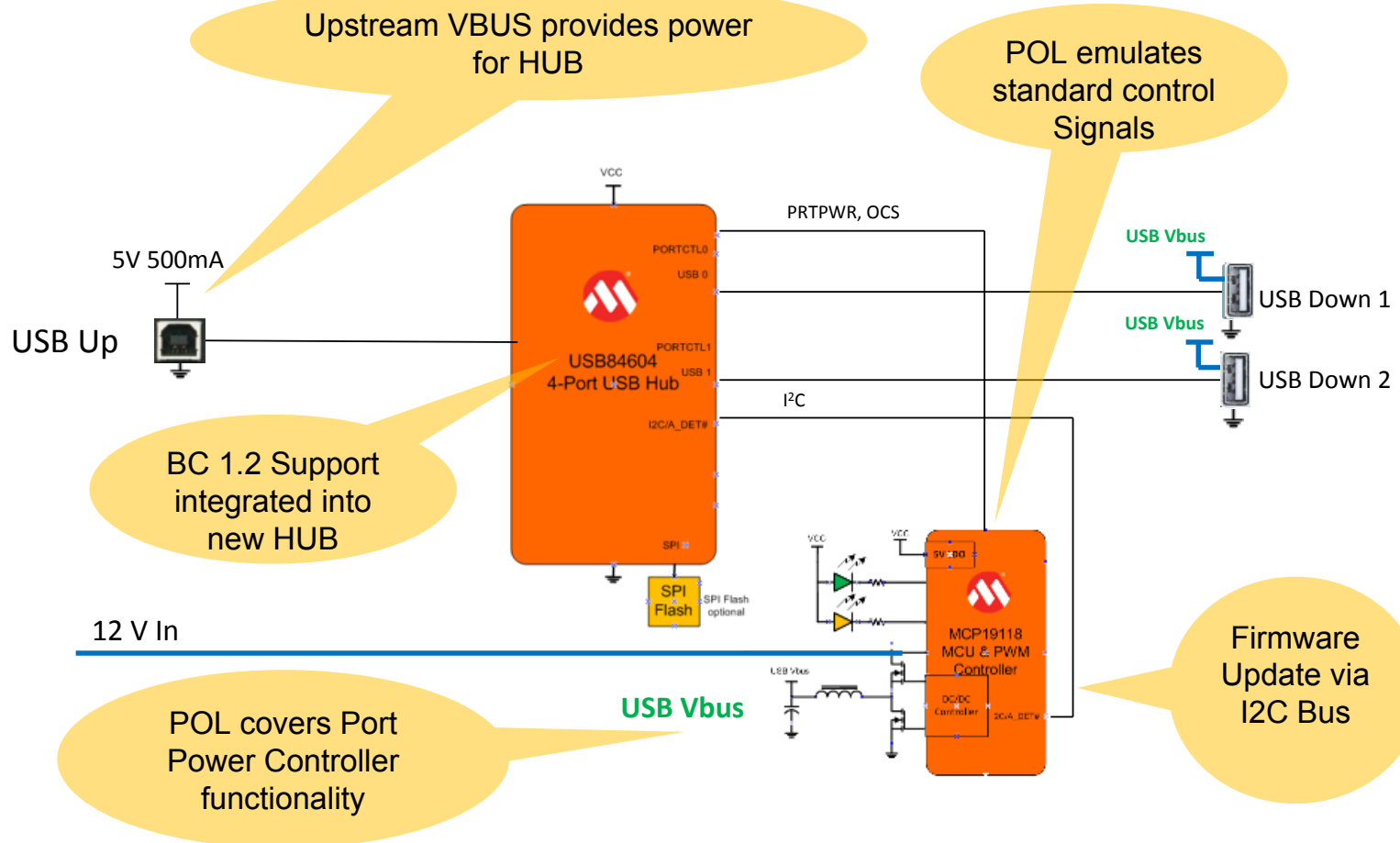
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Typical Break Out Box Design



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Summary

| Spoofed USB

- | Architecture unknown
- | Speed/operational degradation
- | Carplay® compliant ?
 - | Man-in-the-Middle
 - | Authentication
- | Custom host driver required
 - | Field updates likely
- | Unknown risk, wide range of cost of ownership

| Standard USB

- | Architecture known
 - | Standard USB... compliant
 - | Production/Automotive NOW
- | Apple approved demo
- | Standard drivers
 - | USB
 - | Apple
- | Automotive features; BC profiles, phone detach, head unit control
- | No risk, understood cost of ownership