USB OTG v2.x

USB OTG v2.x new features summary

- Supports USB 2.0 Link Power Management (**LPM**)
- Supports the On-The-Go (**OTG**) Specification **2.0**
- Optionally supports:
  - Attach Detection Protocol (**ADP**)
  - Battery Charging Detection (**BCD**) – same as on STM32F0x2
- Various bug fixes embedded
- For HS embeds **ULPI** interface **fix** to support new **SMSC** PHYs

	STM32F2 / STM32F4		STM32L4	STM32F7	
USB OTG IP revision	FS v1.2	HS v1.1	FS v2.0	FS v2.1	HS v2.1
LPM supported	No		Yes		
OTG revision supported	1.3		1.3 & 2.0		
Device BIDIR Endpoints (including EP0)	4	6	6	6	8
Host mode channels	8	12	12	12	16
Total RAM	~1,2 KB	~4 KB	~1,2 KB	~1,2 KB	~4 KB
Other features	-	-	ADP, BCD	-	-

USB OTG v2.x new features in brief

- LPM - Link Power Management

    - This adds L1 (Sleep), a new power state between enabled and suspended states. Device in this state is not required to reduce its power consumption, however, switching between enabled and sleep states is much faster than switching between enabled and suspended states, which allows devices to conserve power while idle.

- OTG revision 2.0 support (when enabled)

    - Adds support for Attach Detection Protocol (ADP)

    - The VBUS pulsing method of SRP is no longer supported. Only data line pulsing is supported.

- ADP - Attach detection protocol (not on STM32F7)

    - Allows an OTG device, embedded host or USB device to determine attachment status in the absence of power on the USB bus.

- BCD - Battery charging detection (not on STM32F7)

    - ability to detect and identify the type of port it is connected to (standard or charging)

- The LPM is introducing a new power-save state, L1 (Sleep), with fast entry and exit times, compared to traditional L2 state (Suspend)

- L1 entry is requested via LPM Token packet, which contains also the value of time, after which the device must be ready to answer after L1 exit (125 us min., 10 ms max.)

- L1 exit is done by Resume signaling, but with much faster timing (ranging from 75 us to 9.95 ms), determined by host based on device capabilities.

- The device can initiate the resume by itself if enabled in LPM Token data (like classical Remote Wakeup), again with faster timing (50 us instead of 10 ms)

- Allows an OTG device, embedded host or USB device to determine attachment status in the absence of power on the USB bus. This enables both insertion based behavior and the possibility for a device to display attachment status.

- It does this by periodically measuring the capacitance on the VBUS line of USB port to determine whether there is another device attached, a dangling cable or no cable.

- When a change in capacitance, large enough to indicate device attachment is detected then an A-device will start to provide power to the USB bus and look for device connection. A B-device will generate SRP and wait for the USB bus to become powered.

- If a portable device (PD) is attached to a USB host or hub, then the USB 2.0 specification requires that after connecting, a PD must draw less than:
  - 2.5 mA average if the bus is suspended
  - 100 mA if bus is not suspended and not configured
  - 500 mA if bus is not suspended and configured for 500 mA

- New port definitions in Battery Charging Specification (Revision 1.2):
  - **Standard downstream port (SDP)** same port as defined by the USB 2.0 spec.
  - **Charging downstream port (CDP)** normal port with extended current capability
  - **Dedicated charging port (DCP)** car / wall charger, not able to enumerate

- If a PD is attached to a Charging Port (ex.: CDP, DCP), then it is allowed to draw max 1.5 A without having to be configured or follow the rules of suspend.