



MIPI 4-Lane/USB3.0 Image Capture Solution



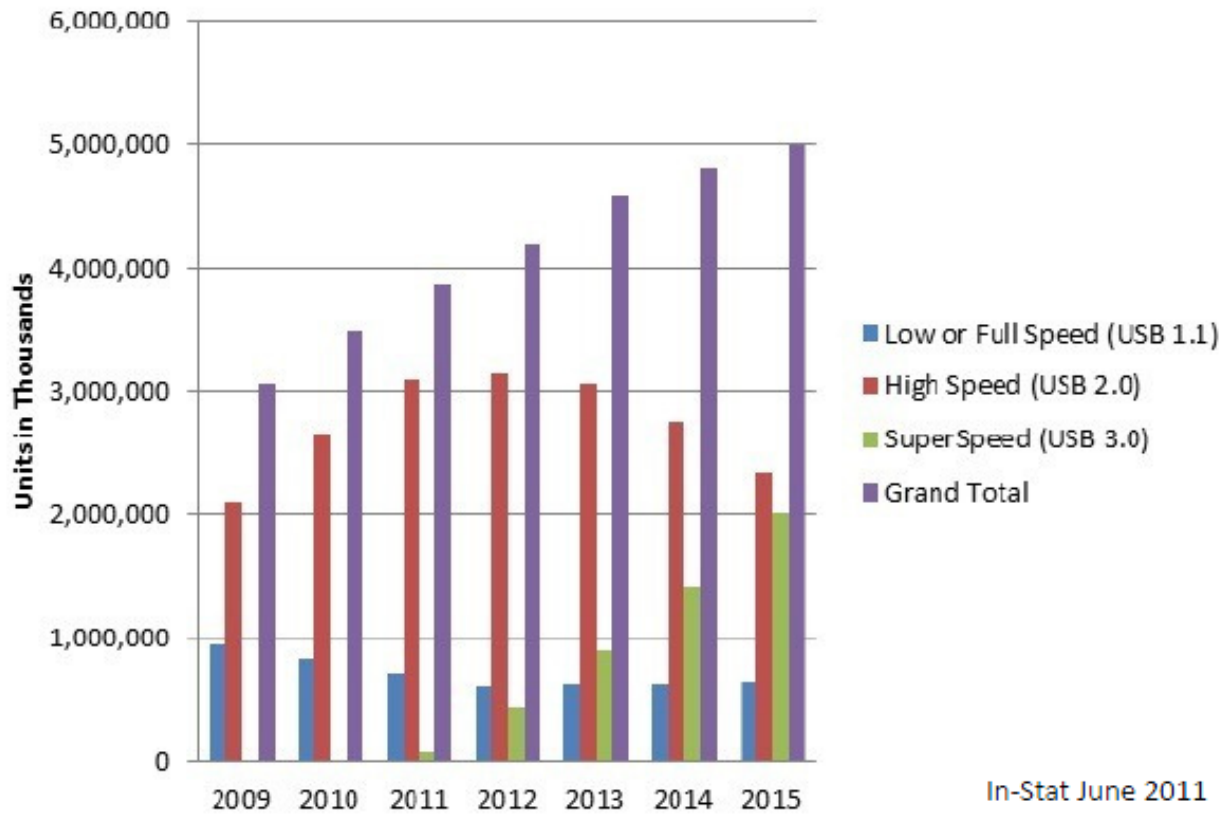
LaonPeople Inc.
2011. 11.

Why USB 3.0?



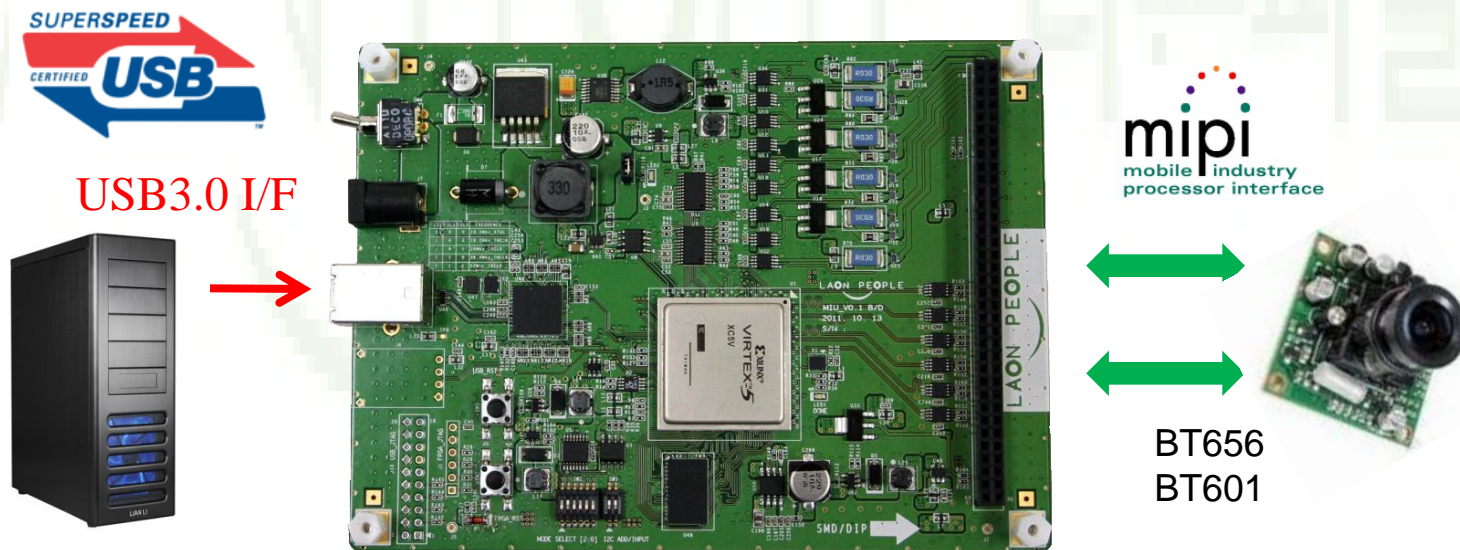
- Why USB 3.0 ?
 - USB 3.0 (SuperSpeed USB) is the next generation of the popular plug and play Universal Serial Bus specification.
 - Approximately 10 times the bandwidth is available with USB 2.0.
 - Wider bandwidth is a perfect solution for high resolution/high speed camera module test.
 - It can support multiple sensor by using wide bandwidth.
 - **For guaranteed image data delivery**, LaonPeople uses “Bulk Transfer” rather than “Isochronous Transfer”.
 - Many mother-board or add-on cards are available now.

USB Device Market Forecast



LPMC-500

- **Fully integrated image capture solution** which can support both high-speed serial interface up to 4-lane MIPI CSI2.0 and conventional parallel interface such as CCIR601, by using SuperSpeed USB 3.0 upload interface.





Key Features

- Support conventional parallel interface
 - CCIR601 up to 180 MHz.
 - Image data format : up to 12 bit data bus (up to 3-components per pixel)
- Support MIPI CSI2.0 interface
 - Up to 4 lanes (up to 1 Gbps per lane)
 - Input image format
 - RAW format : RAW8, RAW10, RAW12
 - YUV format : YUV422 8bit
 - RGB format : RGB565, RGB888
- Image data upload/programming interface
 - Image data upload by using USB3.0 interface up to **2.5 Gbps speed**.
 - Both camera module and LPMC500 are programmable by using the same USB3.0 interface.
 - LPMC500 supports IIC/SPI sensor programming interface.
- **Optional dynamic/standby current measurement**



Advantages

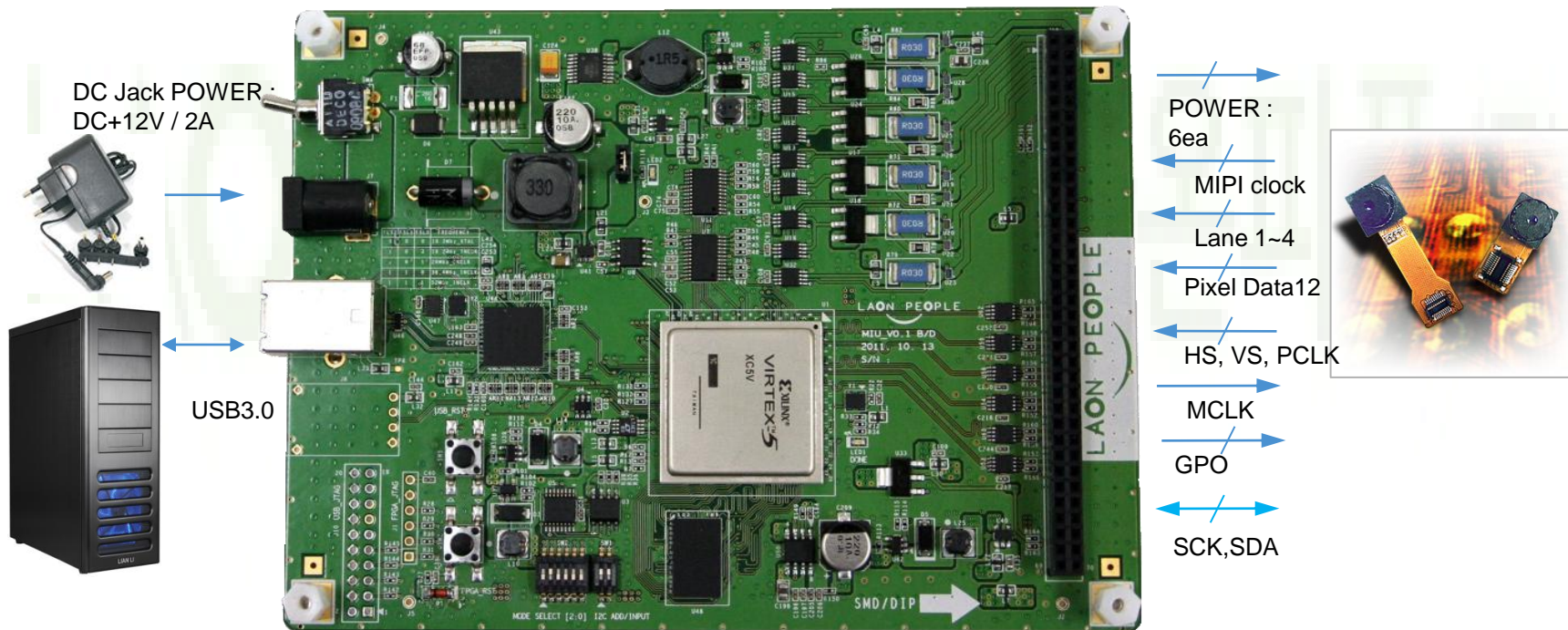
- Flexible configuration based on FPGA
 - Easily meet customer's customization request
- **Higher test coverage** by supporting full frame-rate
- **Higher reliability** with thousands of ON/OFF test
 - Very important factor in automated test instruments.
- Wider operational MIPI/Sensor input clock source
 - MIPI Lane speed : up to 1 Gbps
 - Programmable sensor-input clock generator : 1KHz ~ 64 MHz
- **Fastest and integrated image capture solution**
 - Up to 2.5 Gbps image upload speed.
 - Conventional parallel and MIPI serial interface
 - Dynamic/Standby current measurement



Advantages

- Faster programming and image upload
 - High-speed register download by full-duplex USB 3.0 channel and efficient packet structure.
 - Fully hardwired sensor IIC interface.
 - High-speed image upload by USB 3.0 channel.
 - **Short test time from sensor initialization to the image upload -> Reduce test cost and increase test throughput.**
- Simple and cost-effective solution
 - **No need** for expensive frame grabber like Camera-Link based solution.
 - **No need** for expensive and un-flexible Camera-Link cable.
 - Single board.
 - Both image upload and camera module programming are done by using **single** USB3.0 cable.

LPMC-500 Board Interfaces



LPMC-500 H/W Specification

Model Name	LPMC-500, MIU
Input Interface format	MIPI 1,2,3,4 Lane, CCIR601 Conventional parallel interface
Image data upload	USB 3.0 Interface, Maximum data rates – 2.5Gbps
Internal Buffer Memory	512Mbit DDR2(x16) 1ea
Connectors for camera Interface	Connector 70 pins 2.54mm pitch
Configuration for LPMC/Camera module registers	Through USB packet
Number of Power for Camera	2 Fixed 5V source, 4 Programmable power source
Sensor Clock	Programmable 1KHz ~ 64MHz, by programming the Clock Generator
Power Supply	DC +12.0V / 2A
Dimensions	137.0mm x 110.0mm

- **The features and specification are subject to change its performance without notice.**

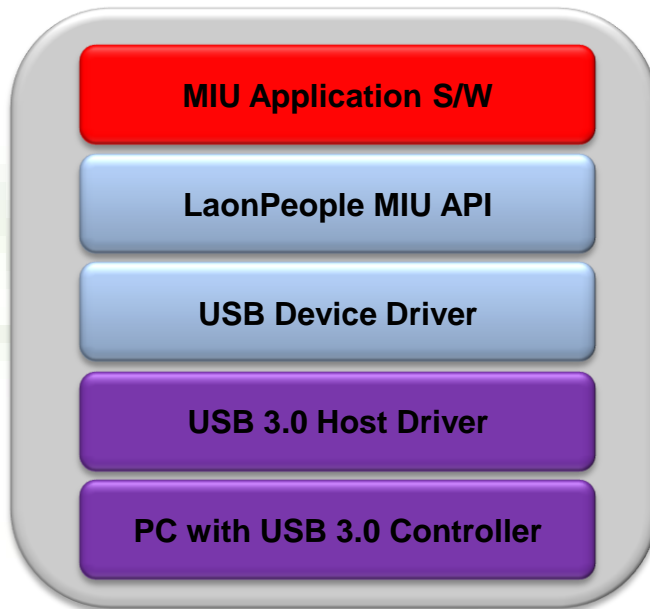


S/W Architecture

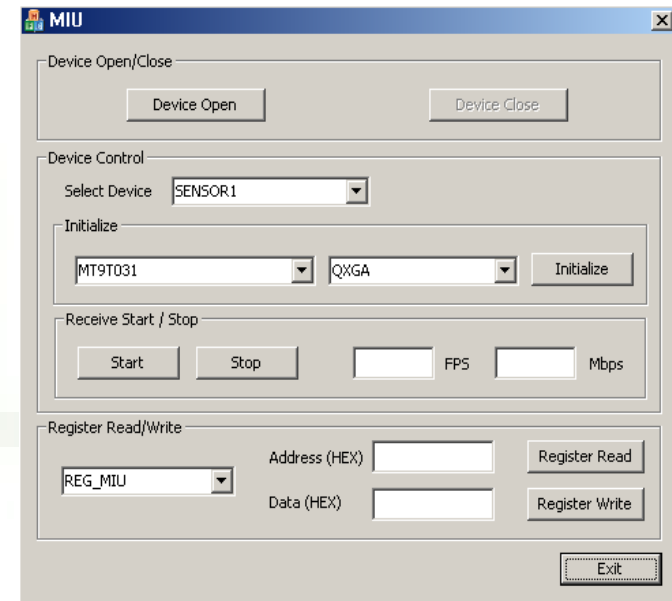
- LaonPeople provides **Device Driver**, **MIU API** and reference **PC Application S/W**.
 - User can develop or port his own application SW **in a short time**.
- MIU API consists of the following functions.
 - Image data transfer.
 - Sensor register read/write.
 - MIU FPGA control.
 - USB device controller control.
 - Sensor Power supply control.
 - (Optional) dynamic/standby current measurement.
 - Other MIU H/W control.
- Each H/W component can be easily configured by “**Configuration File**”.

HOST S/W Architecture

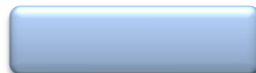
< PC S/W Layer >



< Reference PC Application UI >



*LaonPeople provides this by **reference source code**.*

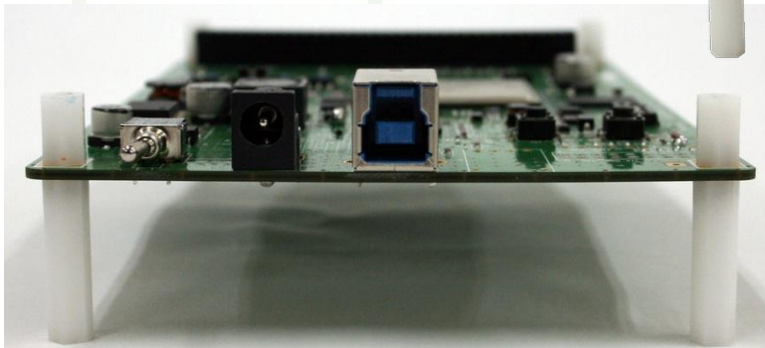


*LaonPeople provides this by **library**.*



*USB Host chip supplier provides this by **library**.*

Board Pictures



Customization

High-Speed Image Upload Solution

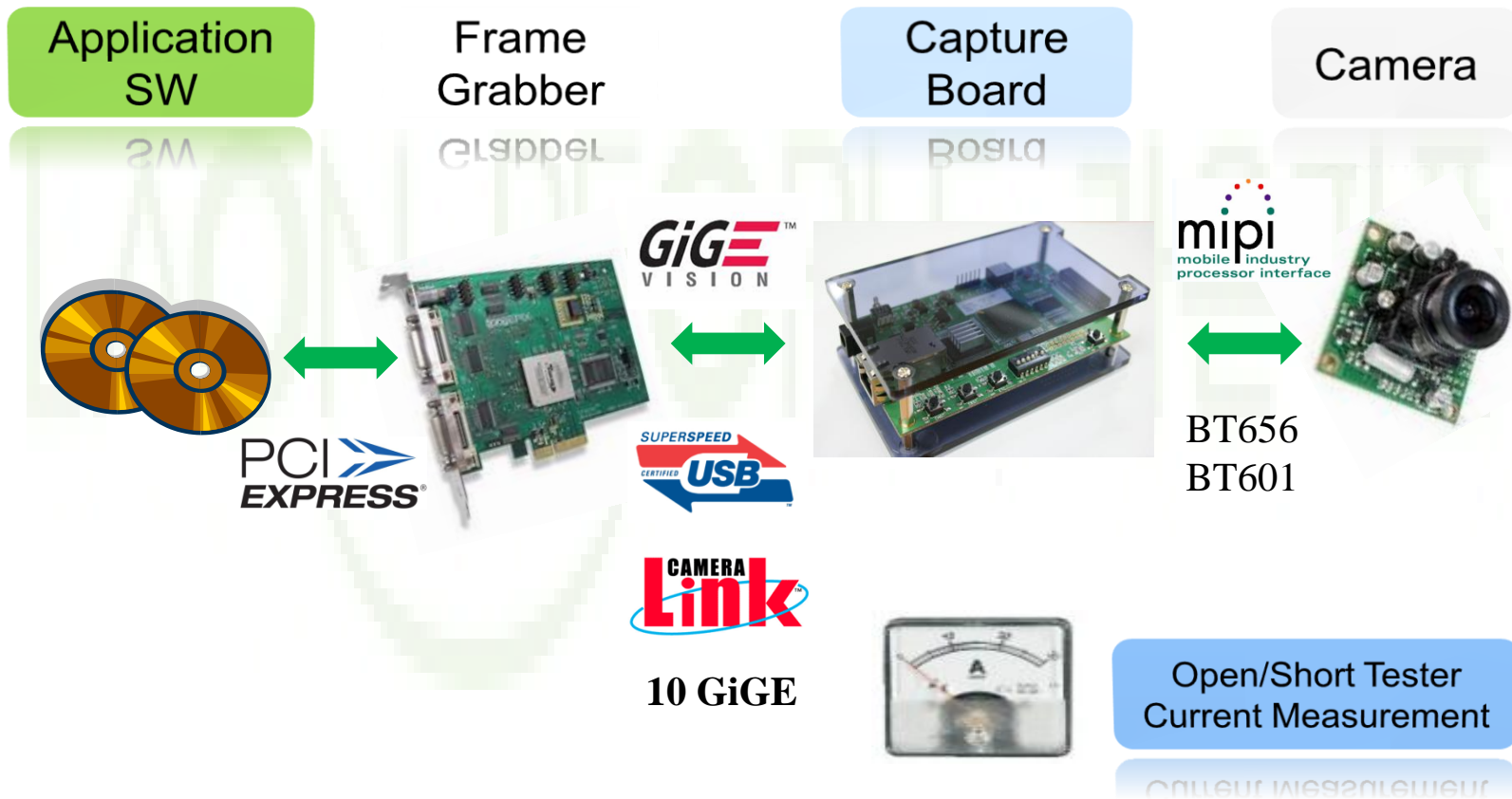
	Real Upload Bandwidth	Need Frame Grabber ?	Cable Length	Overall Cost
MIPI 4 Lane + Gigabit Ethernet	Up to 960 Mbps	no	100 m	moderate
MIPI 4 Lane + USB3.0	Up to 2.5 Gbps	no	5 m	moderate

- + **Current Measurement (Optional, on the same LPMC-500 board)**
- + **Open/Short Tester(Optional, different board)**

Appendix



Technology what we have



Data Rate

unit : Gbps

	RAW8		RAW10		RAW12	
	15fps	30fps	15fps	30fps	15fps	30fps
8 Mpixel	0.960	1.920	1.200	2.400	1.440	2.880
10Mpixel	1.200	2.400	1.500	3.000	1.800	3.600
12Mpixel	1.440	2.880	1.800	3.600	2.160	4.320
14Mpixel	1.680	3.360	2.100	4.200	2.520	5.040
16Mpixel	1.920	3.840	2.400	4.800	2.880	5.760

If we assume **15% bus cycle overhead** in MIPI transfer, the real maximum bandwidth we can get from MIPI 4 lane is about **3.48Gbps**.

If real data rate is larger than 2.5Gbps(maxim USB BW), we do frame-skipping.

System Requirements

- Chipset on Main B/D
 - Intel P67/H67 (**PCIe 2.0**)
 - AMD 9 series chipset
- CPU
 - Intel : Intel Sandy Bride Processor , Intel P67/H67 Supported

Core i5	Core i7
Core i5-2390T	Core i7-2600S
Core i5-2400S	Core i7-2600
Core i5-2400	Core i7-2600K
Core i5-2500S	
Core i5-2500T	
Core i5-2500	
Core i5-2500K	

- AMD : FX-4, FX-6, FX8 Series (socket AM3 +)
- Memory
 - More than 2GB
- USB 3.0 Chipset (recommend)
 - NEC uPD7202000(on board or add-on card)
- OS
 - Windows XP, Windows Vista, Window 7

If your mother board doesn't support PCIe 2.0, there can be performance limit.

Contact Point

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Thank you!

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