

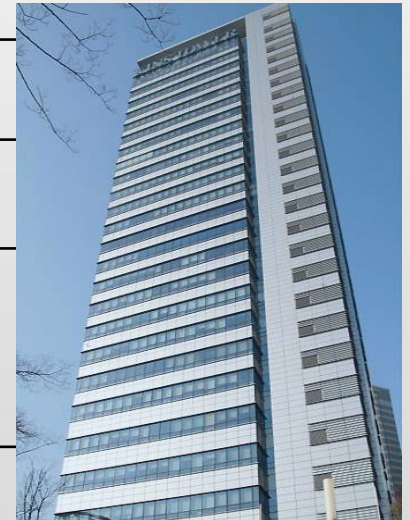
# eMMC<sup>plus</sup> Introduction

**Cho, Chang-bum**  
**The-AIO Co., Ltd.**

**Oct. , 2014**

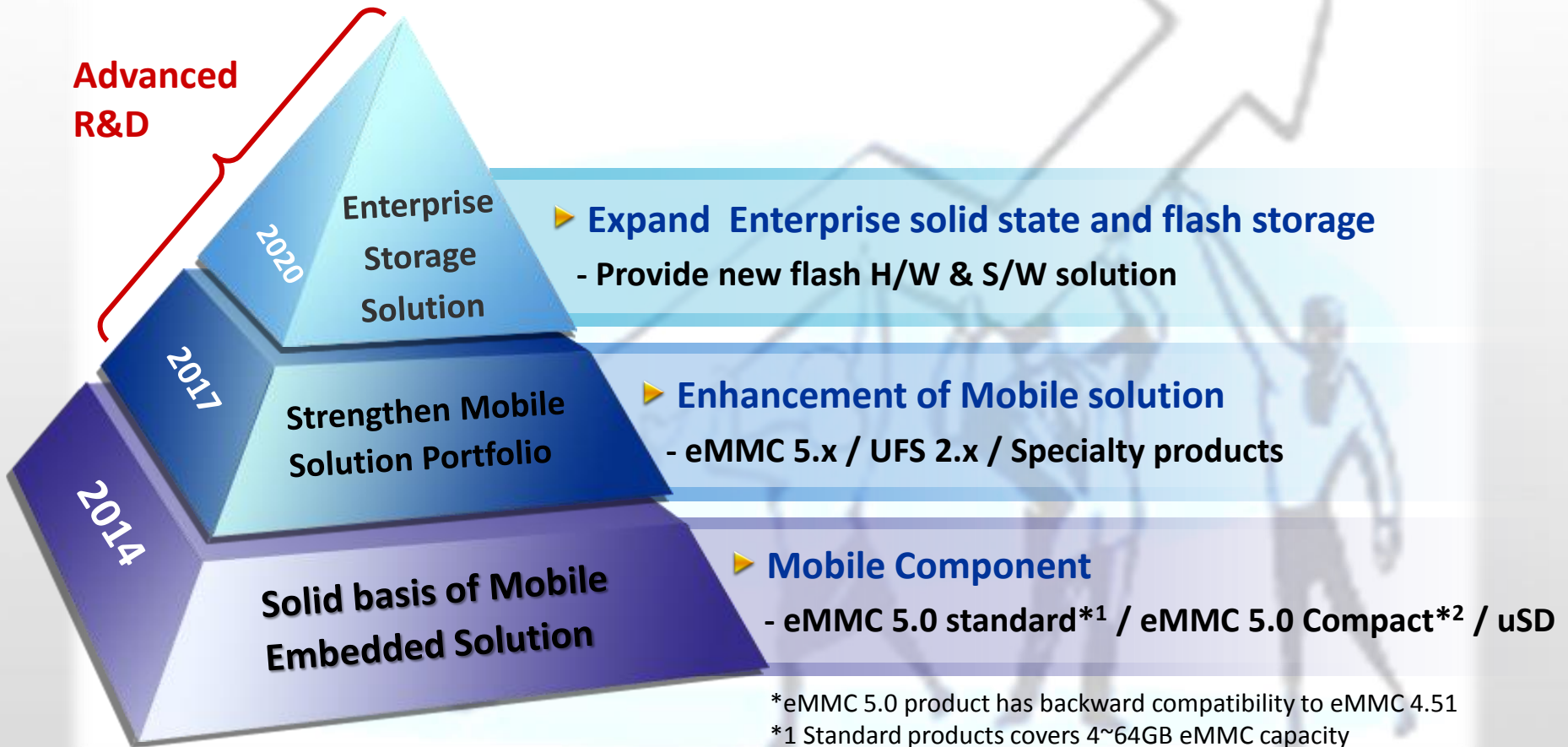
# Company Overview

	Description
Company Name	The-AIO / the-aio co., Ltd. (The Advanced IO)
Vision	Total Storage Solution Provider
Establish Day	Jun 16 <sup>th</sup> 2011
CEO	Jin-Hyoung, Kwon
Products	<ul style="list-style-type: none"> <li>• Standard Product : eMMC/UFS controller and S/W</li> <li>• Differentiated Product : SpikeNAND™, eMMC<sup>Plus</sup> etc. controller and S/W</li> <li>• Storage Sub-System : Enterprise SSD + SW Package</li> </ul>
Employee	56 People (R&D proportion 82%)
Address	KINS Tower 17 <sup>th</sup> Floor, 25-1, Jeongja-dong, Bundang-gu Sunghnam-si, Gyeonggi-do, Korea
Contact	Tel : +82-31-716-0170 Fax : +82-31-716-0580 E-Mail : sales@the-AIO.com Home Page : www.the-AIO.com



# Vision

## Total Storage Solution Provider



\*eMMC 5.0 product has backward compatibility to eMMC 4.51

\*1 Standard products covers 4~64GB eMMC capacity

\*2 Compact products covers 4~16GB eMMC capacity exclusively

# Value Chain of AIO storage solution

- **The AIO delivers our core competitiveness for customer satisfaction**
  - The AIO, the best storage solution partner, provides incomparable performance, highly reliable quality based on technology innovation
  - The AIO values loyalty to customers as well as customer satisfaction



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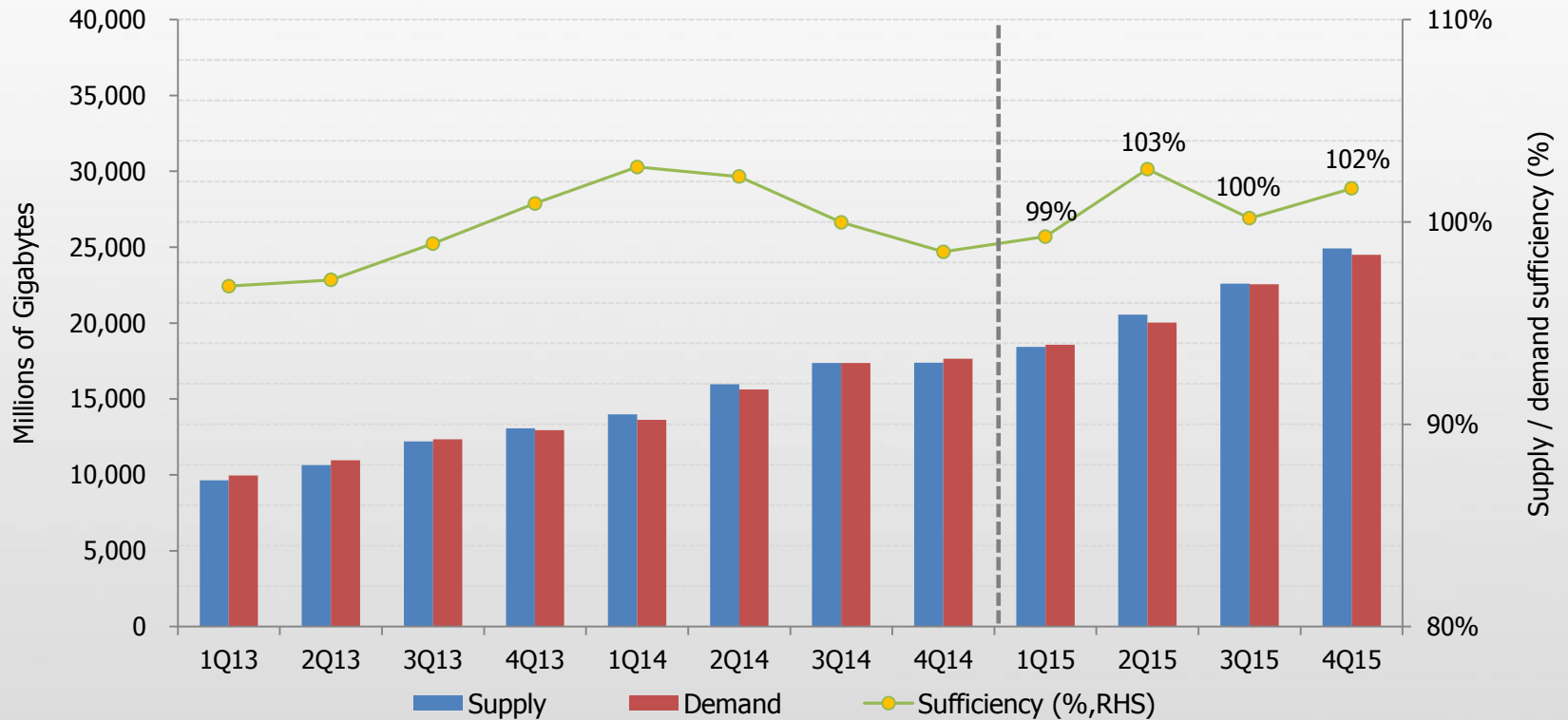
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**Market Trend**

# Market Update (1)

## Macro Flash Memory Outlook ('13~'15)

- '15, NAND flash market is facing oversupply status due to new NAND FABs running
- High-end application's growth rate is struggling to grow
- Modular business is likely to get upside demand from SET or retail market due to price

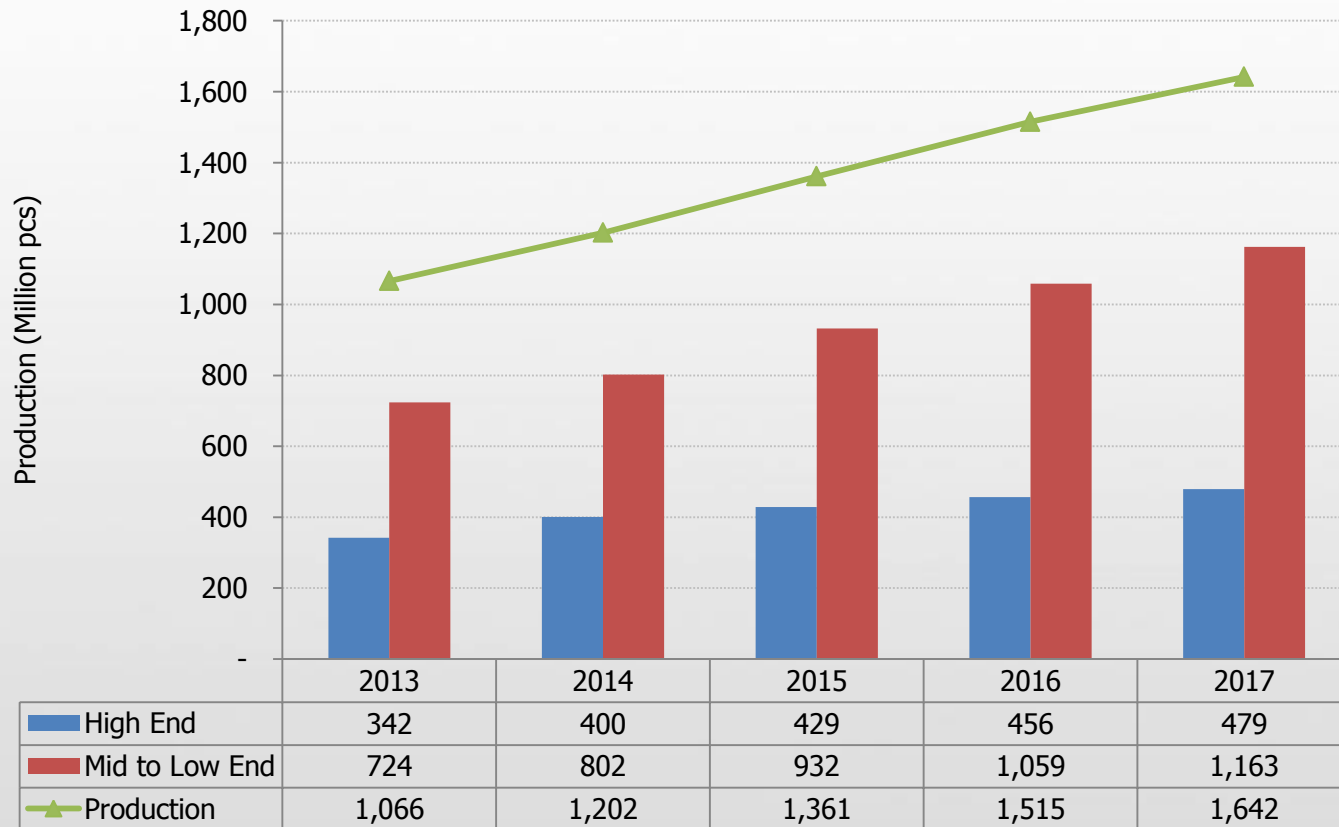


[Source: Gartner 2014 & AIO Marketing]

# Market Update (2)

## ■ Smartphone's annual growth (CAGR '13 ~ '17) is expected around 11%

- High End application's CAGR will be 9%, Mid-to-Low End application's CAGR will be 13%
- High End application's growth rate is getting slow

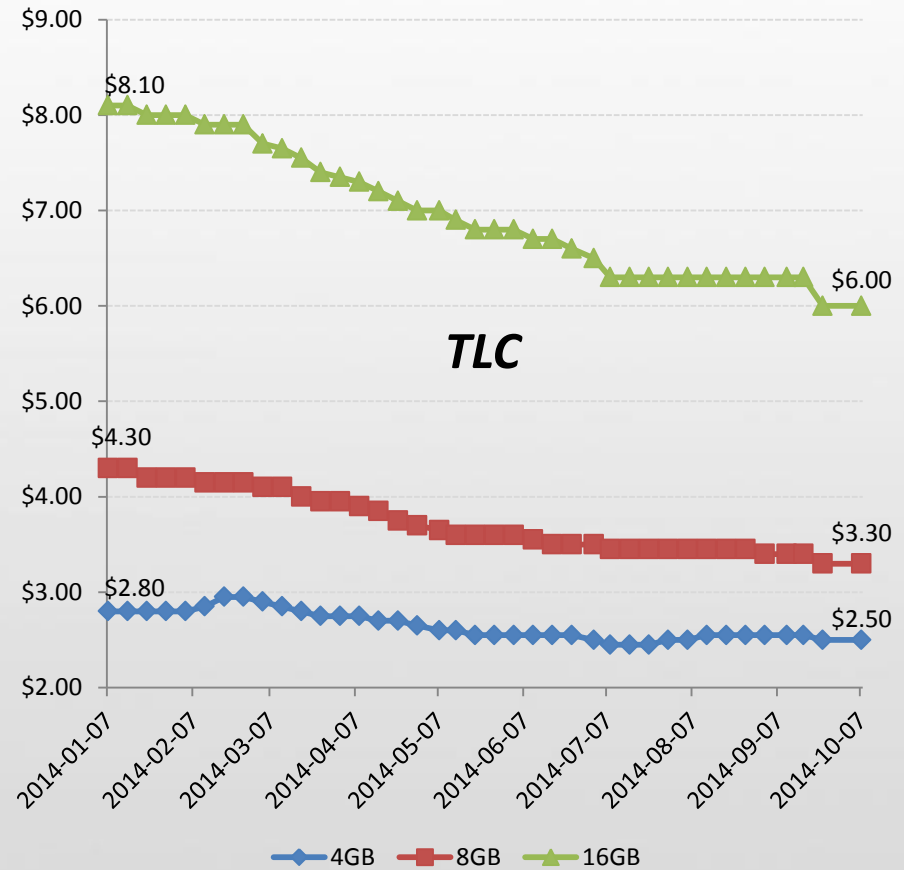
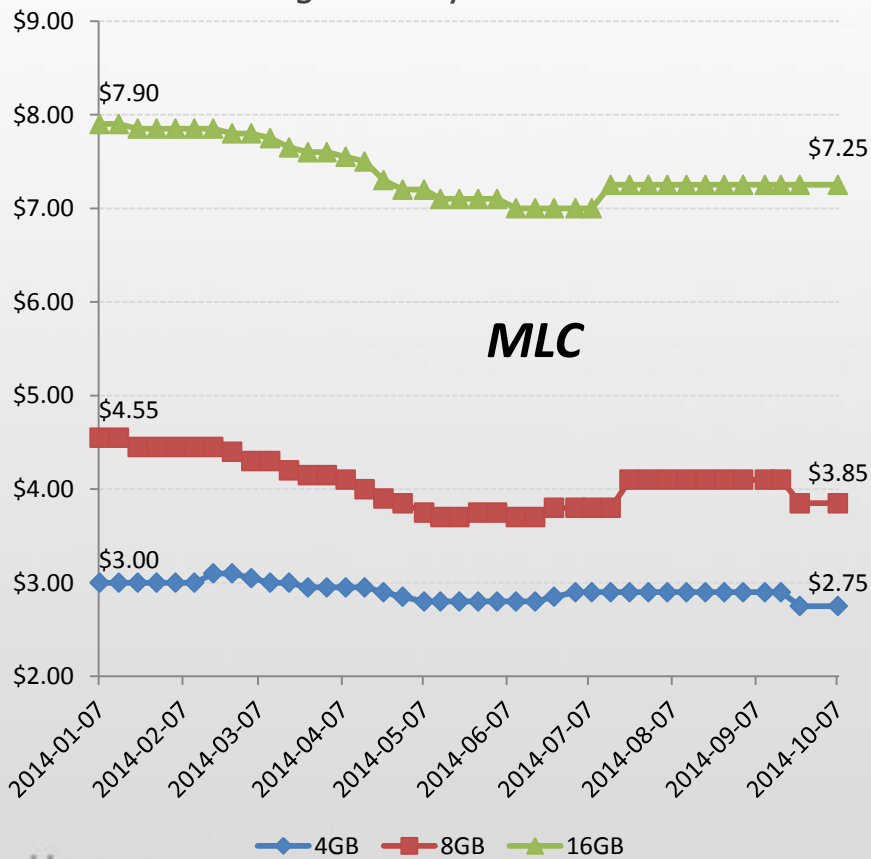


[Source : AIO Marketing estimation, Aug. 2014]

# Market Update (3)

## ■ eMMC price trend

- Until 4Q14, eMMC price dropped by -11%(MLC), -20%(TLC) respectively
- TLC price is likely to drop more at the beginning of 1Q15 (Seasonality)
- Low density eMMC is struggling to get marginal price. Therefore, memory vendors are looking for High density solutions





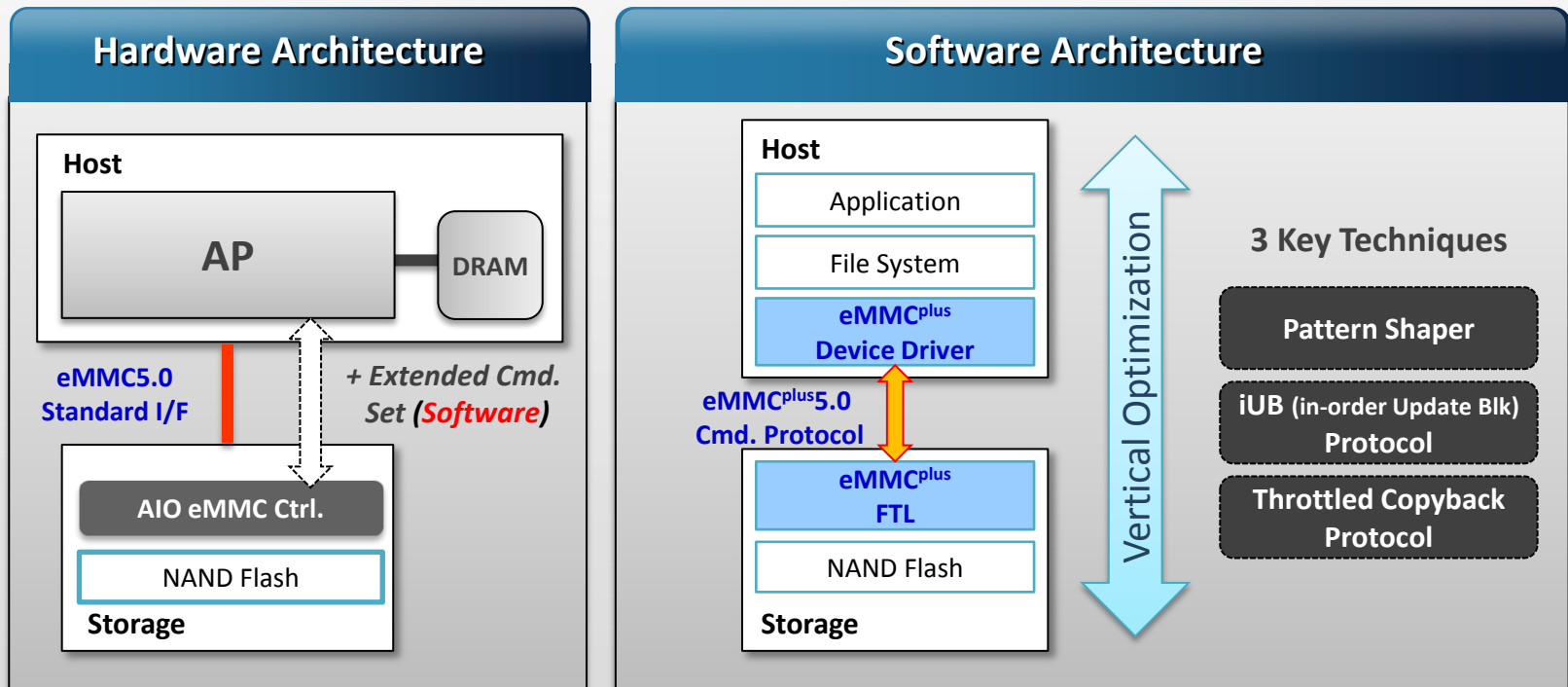
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**Current optimized solution**

# eMMC<sup>plus</sup> 5.0 Solution

- **Advanced eMMC Solution with Full Compatibility with Standard eMMC5.0**
  - No Host Side HW Change needed
- **Higher Performance**
  - **10x Higher Random Write Performance** : Pattern Shaper
- **Reliability with Low Cost TLC NAND**
  - **4x Longer Endurance** : Pattern Shaper / iUB → **Low Cost (TLC instead of MLC)**



# Technical Introduction

## ■ New Tech 1. Pattern Shaper

- Shape random writes into sequential writes

## ■ New Tech 2. iUB Protocol

- [ host ] iUB (in-order Update Block) write
- [device] Simpler mapping to avoid map miss

## ■ New Tech 3. Throttled Copyback Protocol

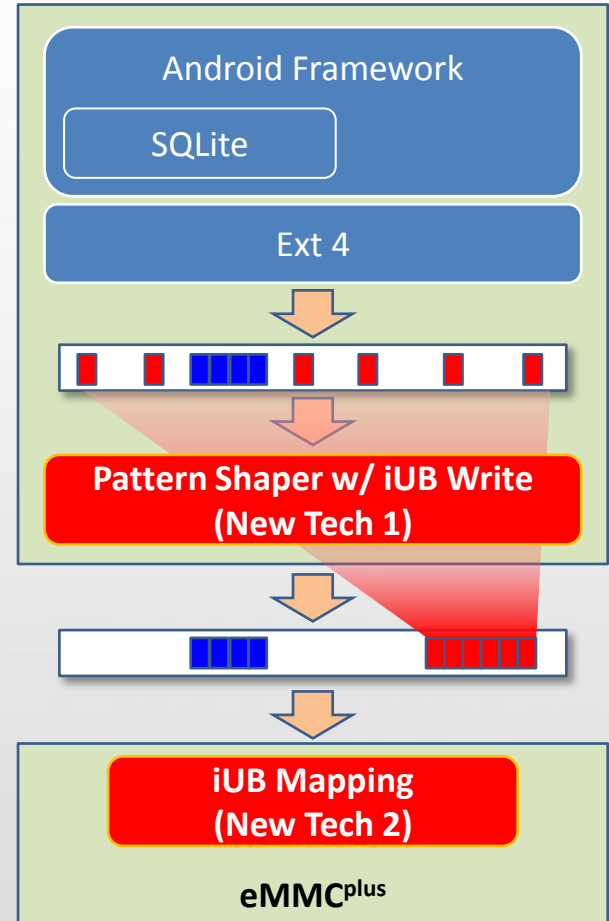
- Progressive & proactive garbage collection to avoid the worst-case performance

*Garbage Collection* Needs to be Performed for (1) Data Separation (2) Constant Performance and (3) Background Cleaning

Our Solution

New Tech. 3

Throttled Copyback



# Demo: Competitor eMMC vs. eMMC<sup>plus</sup>

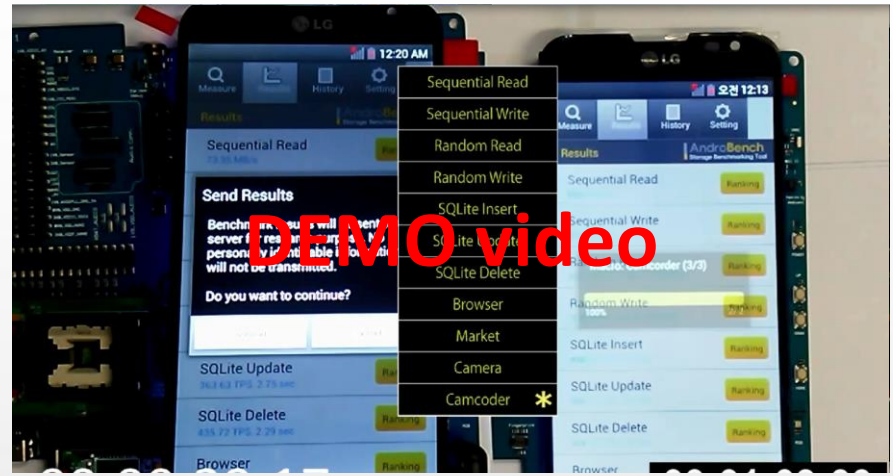
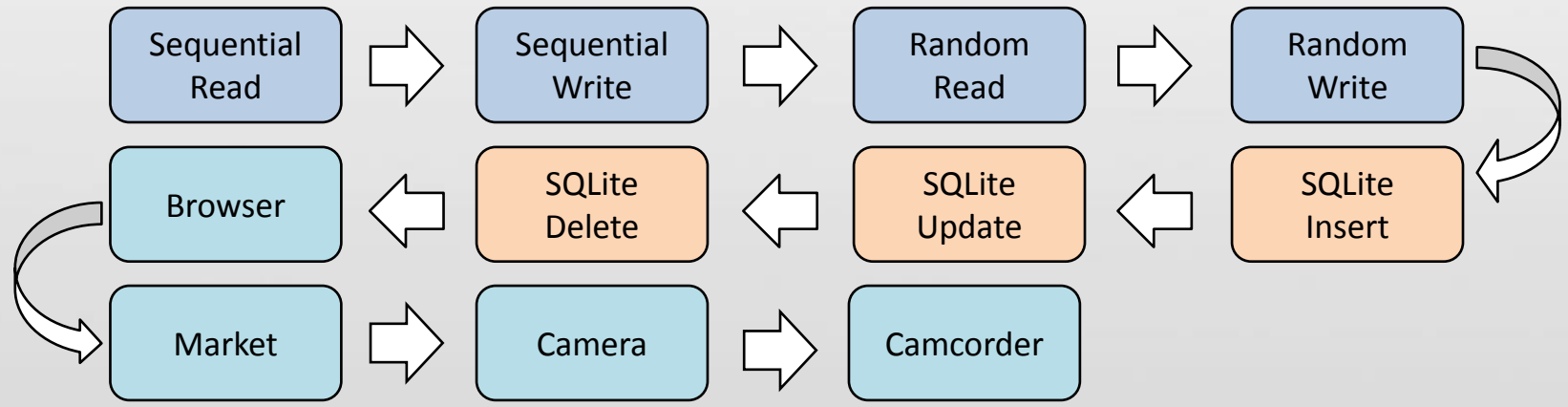
## Androbench Settings

- Write file-size : 16MB
- Read file-size : 32MB
- Sequential IO size : 256KB
- Random I/O size : 4KB
- # of SQL transaction : 1000

File system utilization: 0%

NAND : 64Gb MLC x 2 way

## Benchmark Process



# Demo: AIO eMMC<sup>plus</sup> vs. Competitor eMMC 4.5

■ To see this demo (video clip), please visit our website : [www.the-aio.com](http://www.the-aio.com)

Go to see Video Clip

## Androbench

(File Size: R-32MB/W-16MB, IO Size: Seq-256KB/Ran-4KB)

AIO  
eMMC<sup>plus</sup>

vs.

Competitor's  
eMMC

Android ICS v4.2.2  
Linux Kernel v3.8.0

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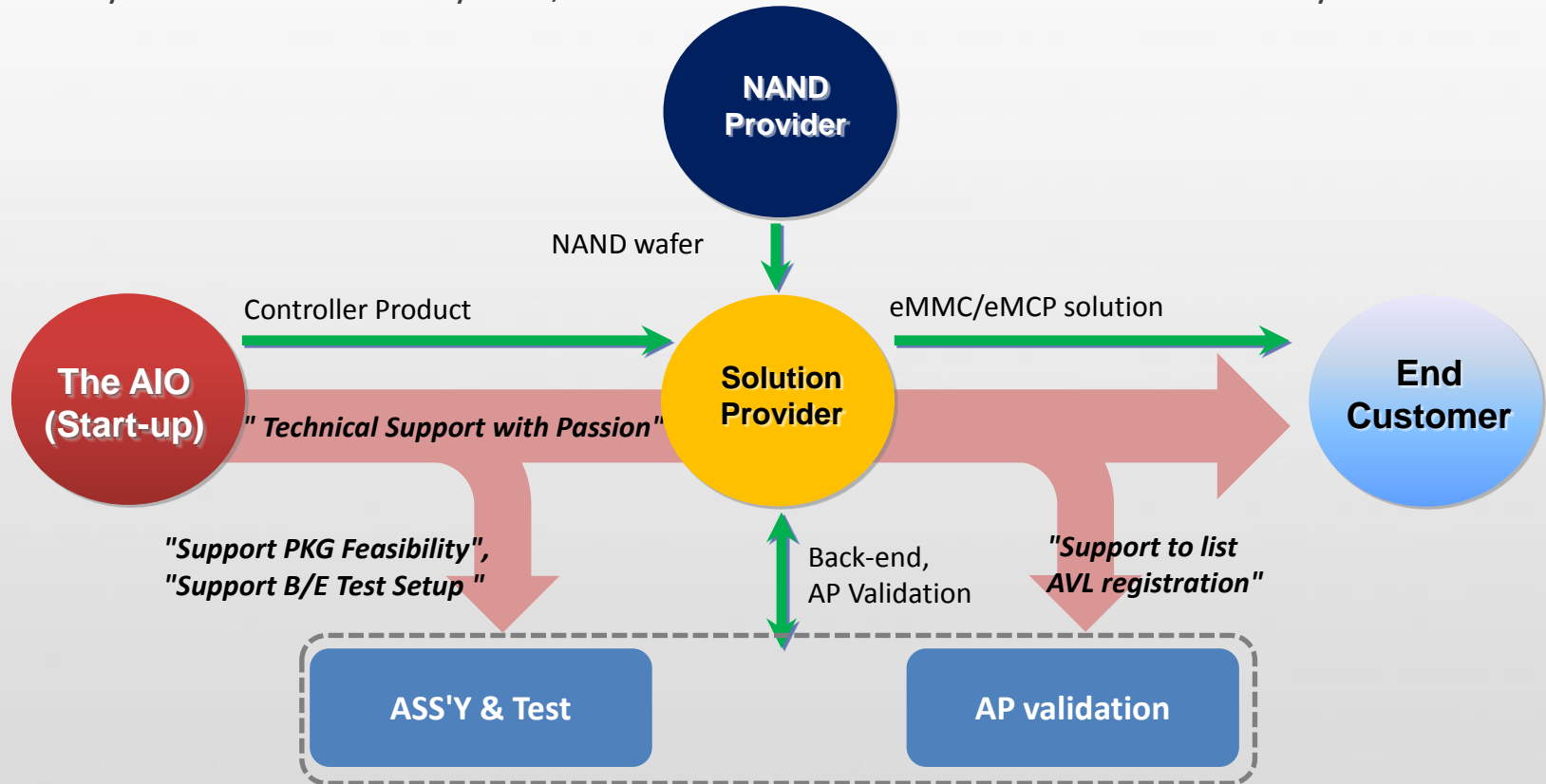
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**Conclusion**

# Relationship is a Key to success

## ■ Through Strategic Business Relationship, succeed in **Embedded Flash Storage Solution**

- Provides proven technology controllers and specialized technical services
- Support customer to setup a eMMC/eMCP 'back-end procedure' & 'device Qual. process' and help to get 'AVL from APs'
- By Joint Qualification system, achieve End-customer Qualification effectively



**Thank You**

**Tel. +82-31-716-0170**

**[sales@the-aio.com](mailto:sales@the-aio.com)**

