# SATA in Mobile Computing

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# Forward Looking Statement

During our meeting today we will be making forward-looking statements. Any statement that refers to expectations, projections or other characterizations of future events or circumstances is a forward-looking statement, including those relating to revenue, pricing, market share, market growth, product sales, industry trends, expenses, gross margin, future memory technology, production capacity and technology transitions and future products.

Actual results may differ materially from those expressed in these forward-looking statements due to the factors detailed under the caption “Risk Factors” and elsewhere in the documents we file from time-to-time with the SEC, including our annual and quarterly reports.

We undertake no obligation to update these forward-looking statements, which speak only as of the date hereof.

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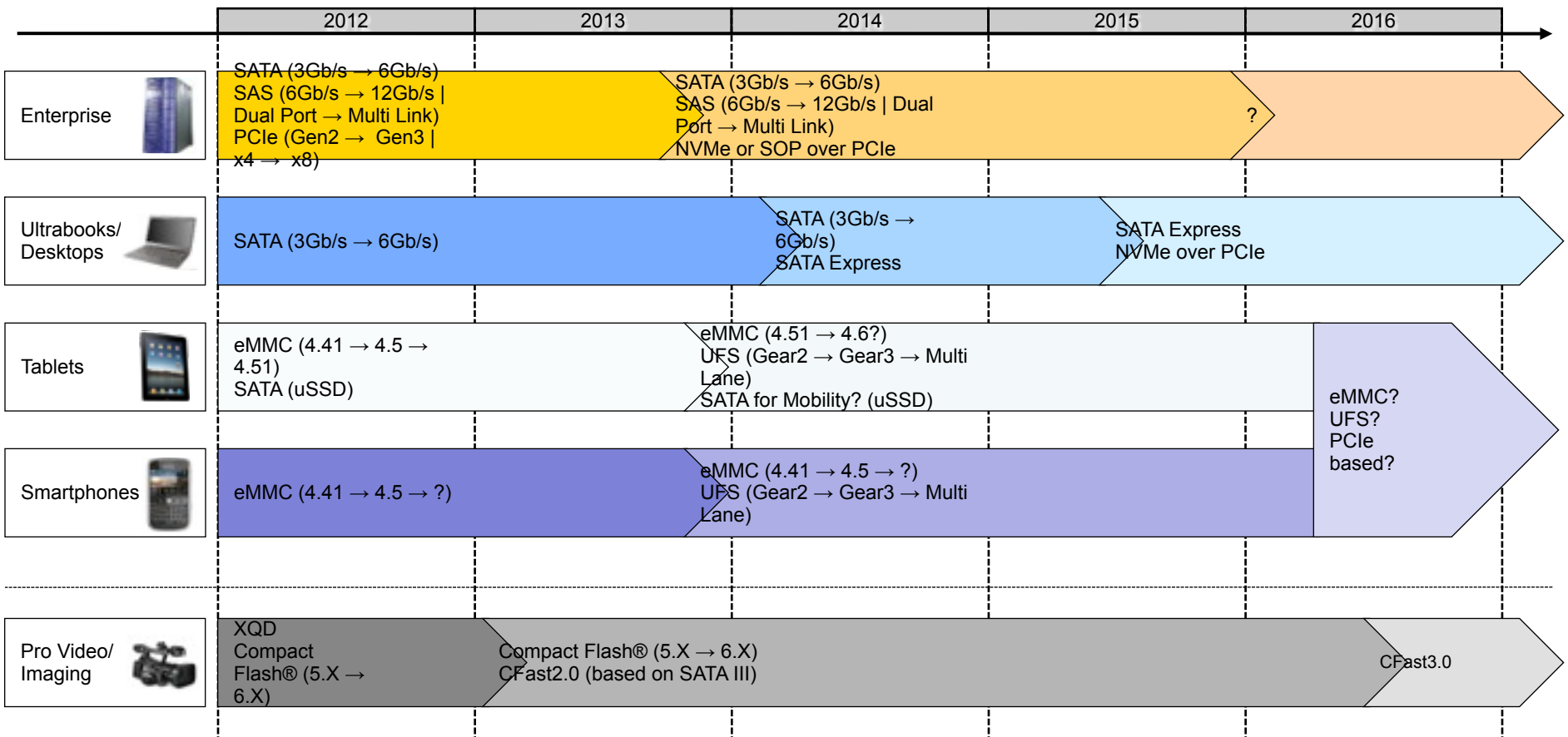
  - What are the challenges and possible solutions?
  - What are the potential ecosystem benefits?

# Market Status Update

# Possible Industry Interface Convergence



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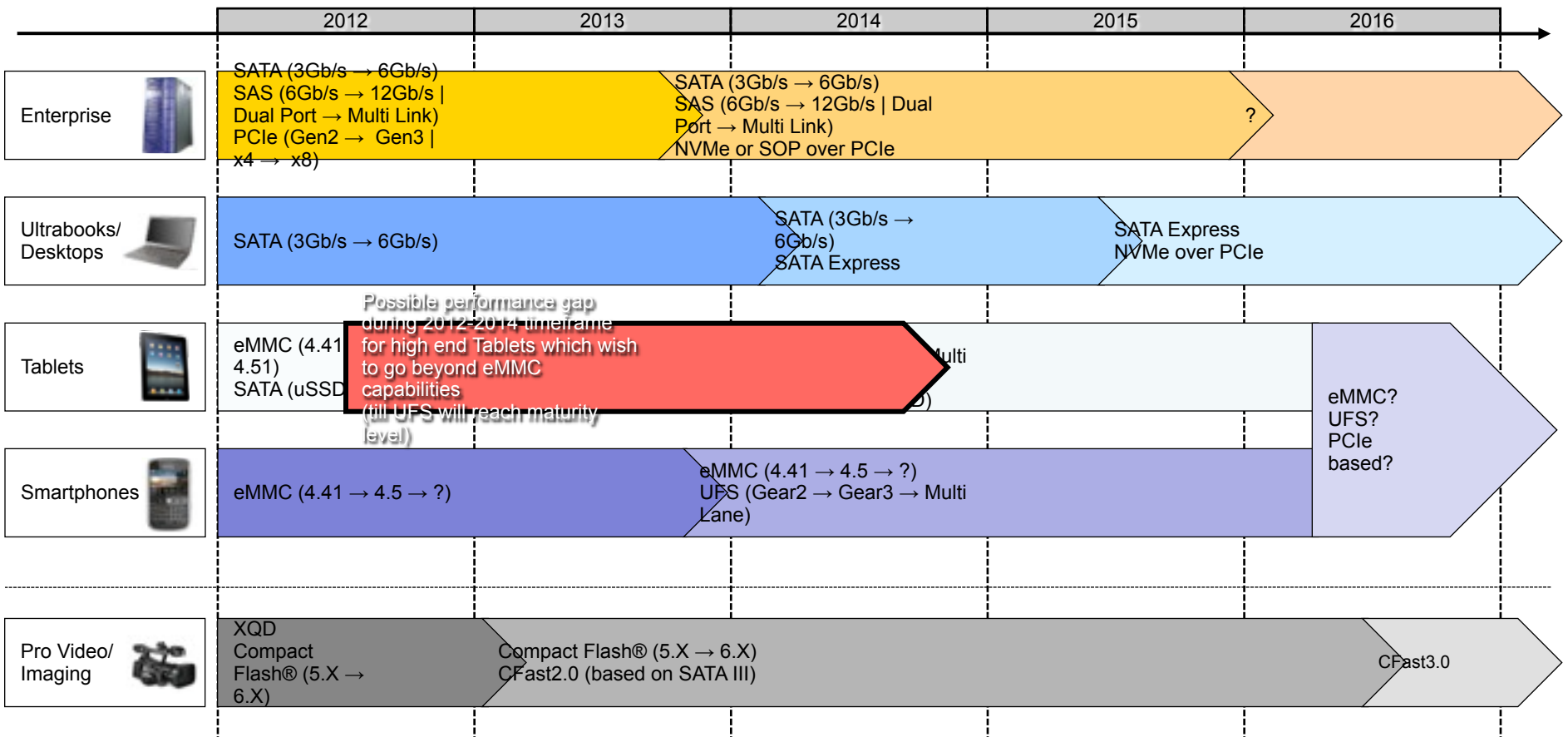
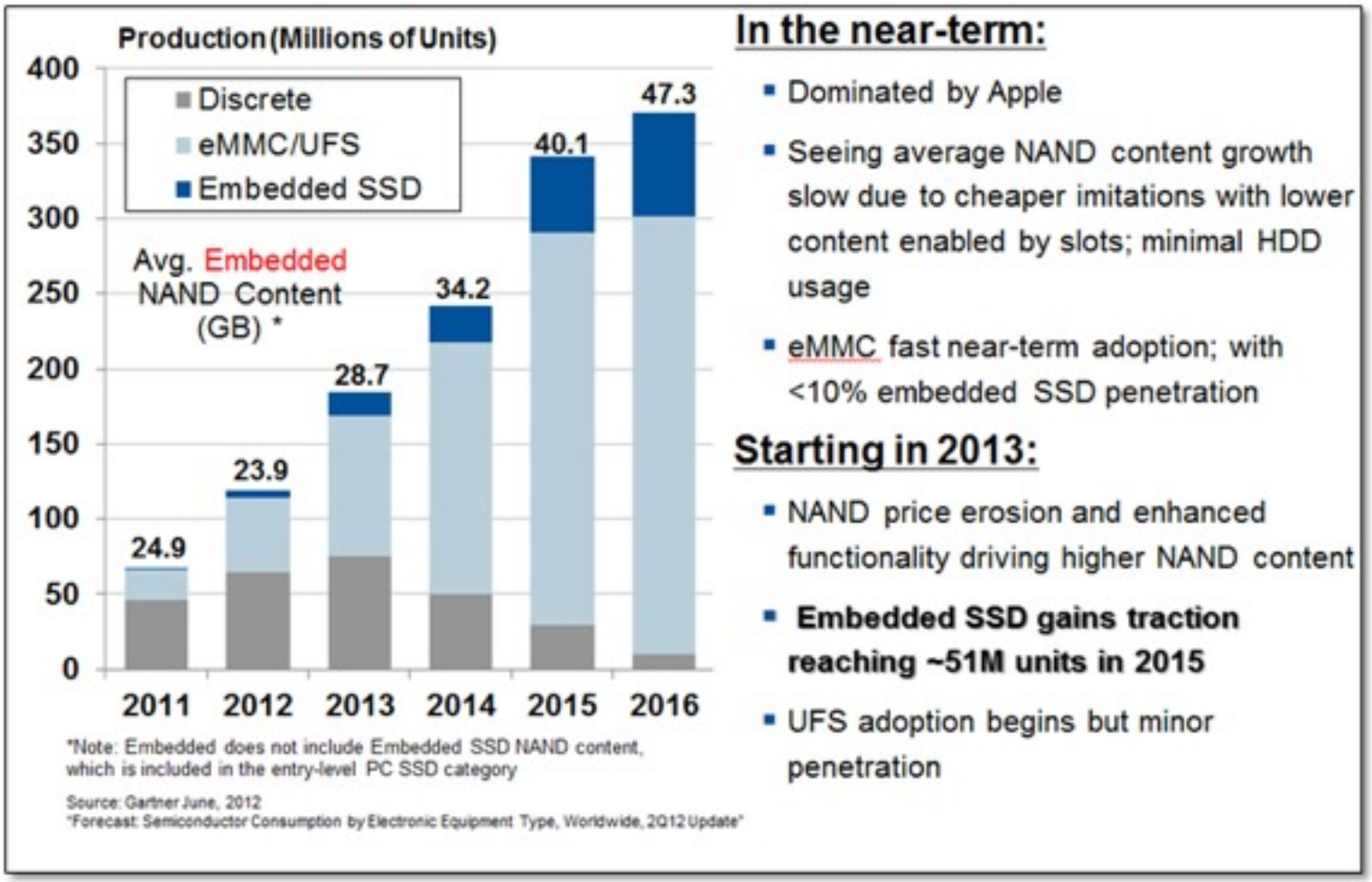


# Media Tablets Forecast



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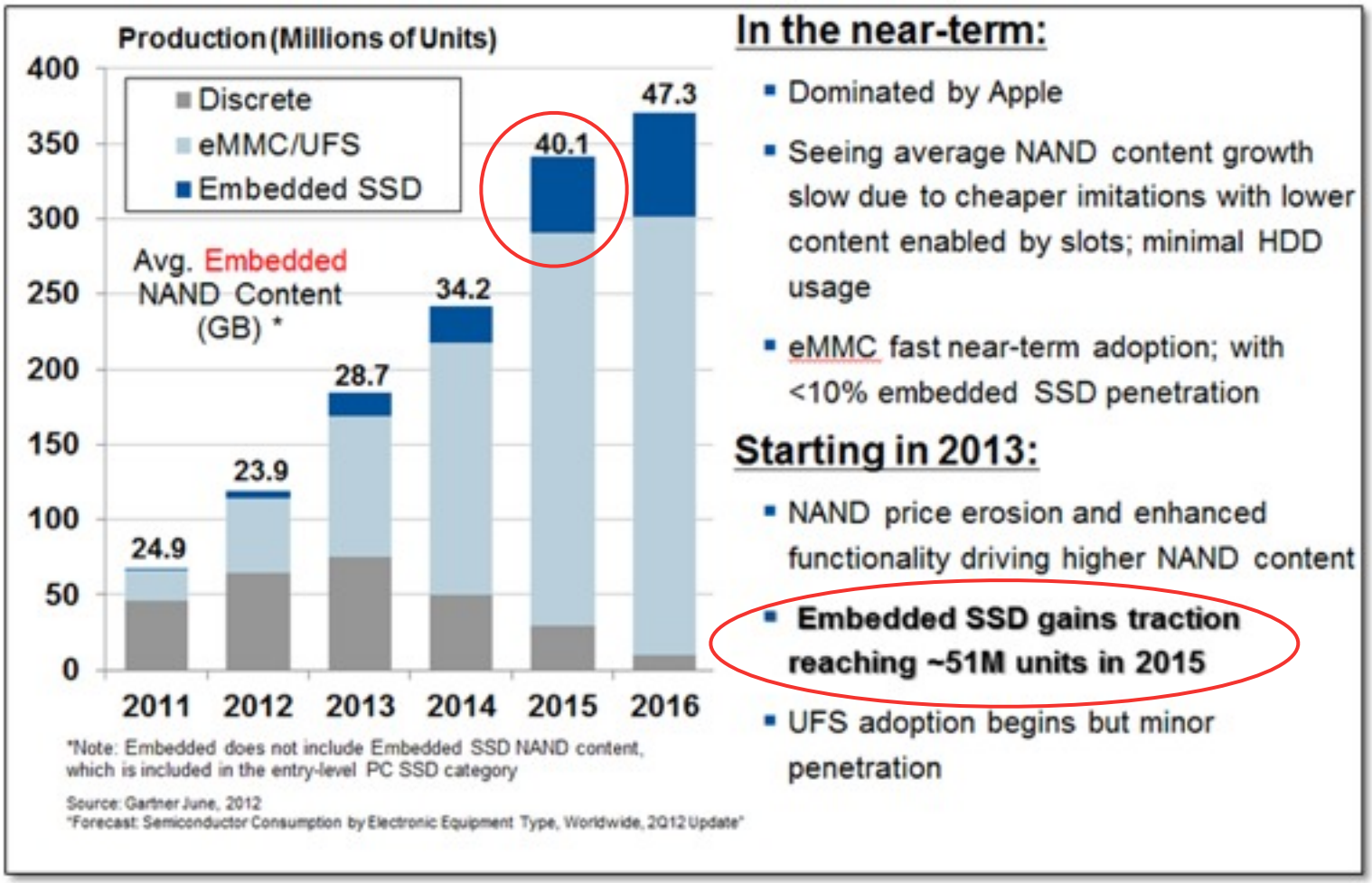


# ARM Ecosystem SATA Support

| Vendor | Chipset | SATA Support |
|---|---|---|
| nVidia | Tegra 3 | Yes |
| Qualcomm | APQ8064 | Yes |
| Freescale | iMX6 | Yes |
| TI | OMAP5 | Yes |
| STE | 9600 | Yes |

* The table is based on public announcements made by the respective companies.

# SanDisk iSSD™ SATA Experience

- SATA III performance
  - Up to 450 MB/s sequential read*
  - Up to 350 MB/s sequential write*
  - Up to 7.8K IOPS 4K random read*
  - Up to 920 IOPS 4K sustained random write*

* Based on SanDisk internal testing; performance may be lower depending on host device.

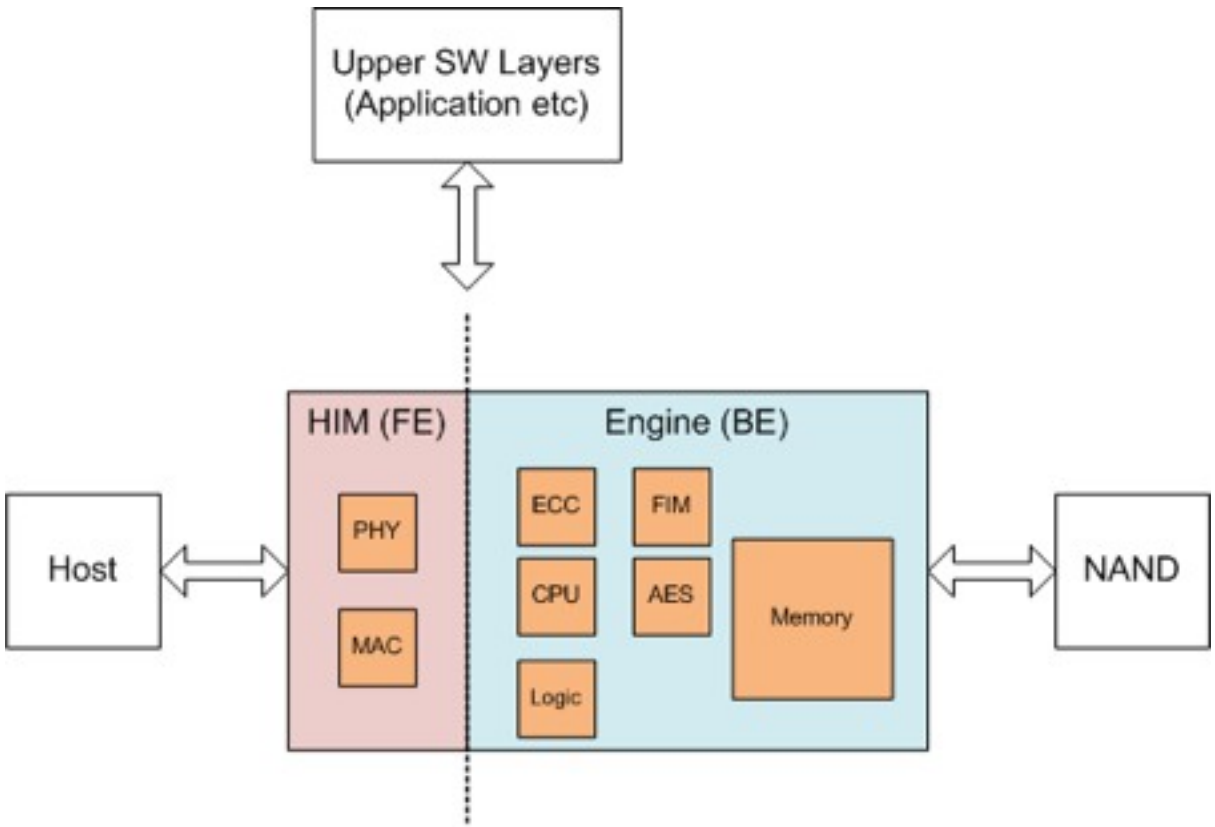
** iSSD is based on SATA uSSD standard.

# Challenges for SATA Adoption in Mobile

# Power – Some Facts

- Power is considered as main SATA barrier
- Current market perception is that SATA I/F sleep power is much bigger than other high speed serial I/F such as UFS for example
- Storage power budget is low compared to other components when looking at overall system
- High performance enables quicker transition to low power modes which reduces power consumption

# Storage System High Level Diagram



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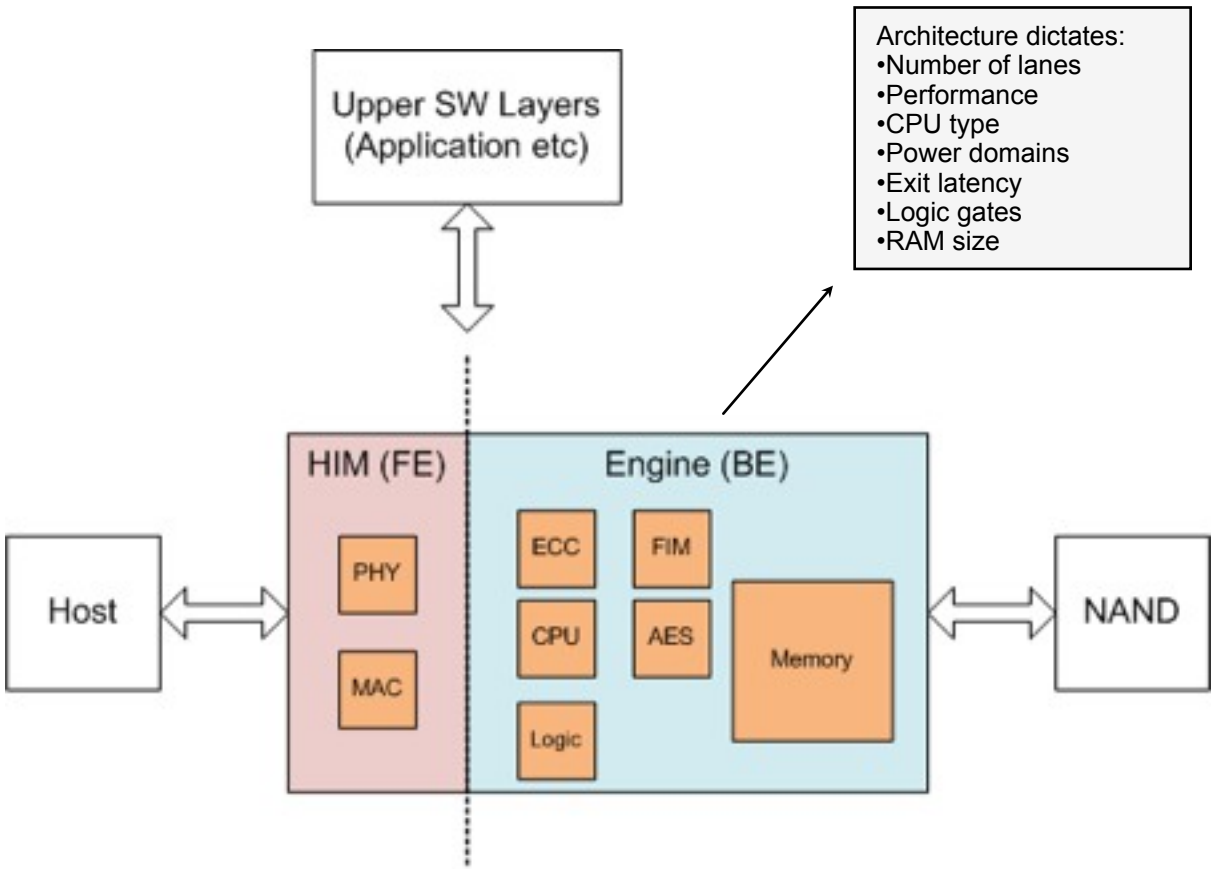


# Power – Sleep Power

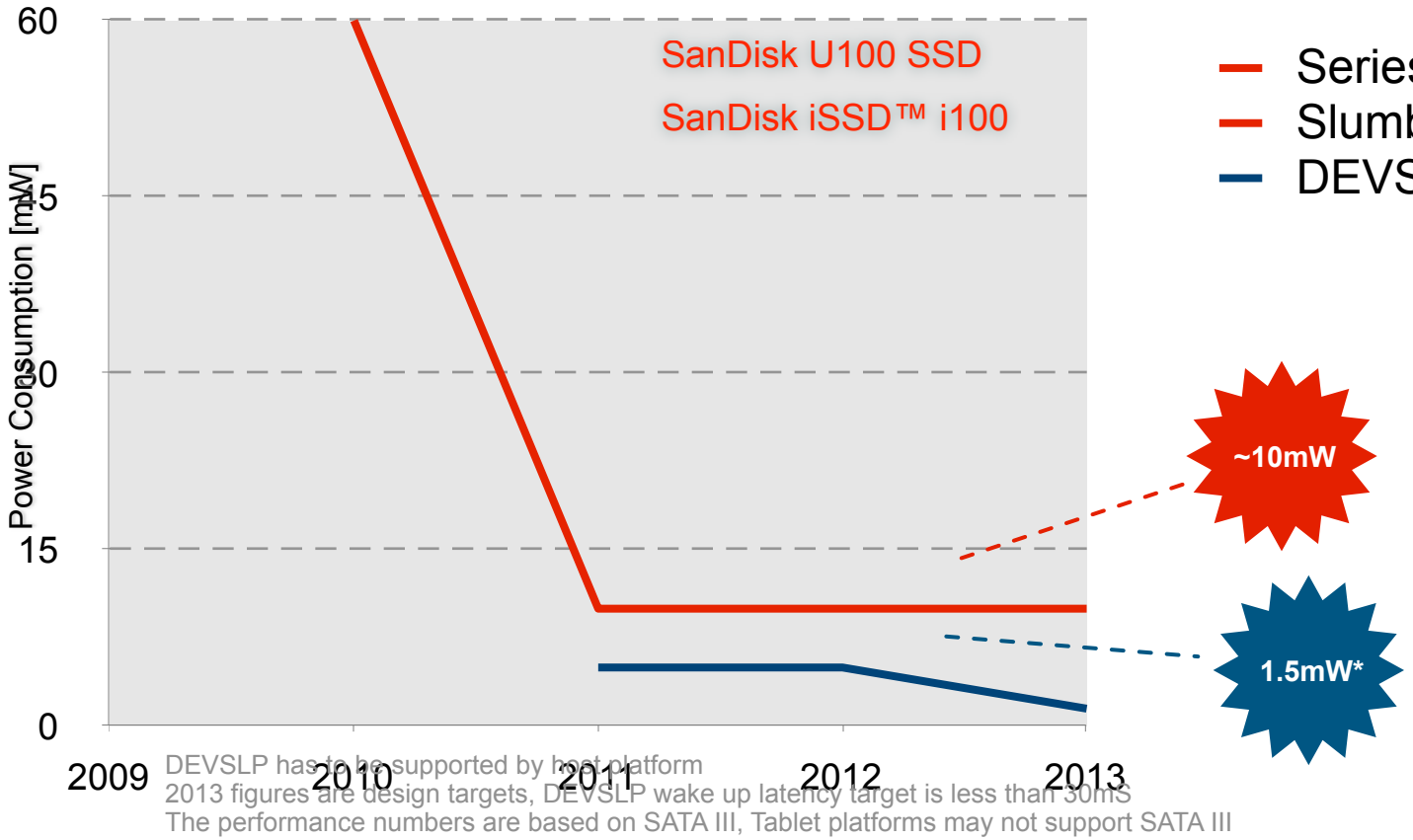
- System performance is being determined by the type of engine we use
- With DEVSLP (SATA31_TP_038) introduction → no matter what will be the HIM type, sleep power in high performance systems will be dominated by the engine and not by the interface
- As an example, serial high speed PHY such as SATA PHY can consume 10x [µW] while high performance system engine will consume 100x [µW] – factor of ≥10

# Power – Active Power

- Interface active power consumption can be separated into two parts:
  - PHY consumption - depends on TX, RX, CDR and PLL specific design/architecture in order to comply with the spec
  - Bus toggle consumption (smaller portion)
- Although some difference might occur when using one HIM vs. another (due to PHY design/ architecture, voltage swing, spec difference etc.), the variance should be small in high speed systems

# Power & Thermal

## *Breaking The Myth Of Power Hungry SSDs*




DEVSLP has to be supported by host platform
2013 figures are design targets, DEVSLP wake up latency target is less than 50mS
The performance numbers are based on SATA III, Tablet platforms may not support SATA III

# Mobility Features?

- Boot
  - Incorporate SATA initialization code into SoC ROM code
- Additional power modes
  - DEVSLP already standardized in SATA-IO
  - Is there a need for additional mode?
- Partitions
  - Flash aware regions and attributes like reliable partition for boot code and enhance partition for OS/FS
- Reliable write
  - What happens in case on power failure
- Security etc…

# Potential Ecosystem Benefits

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- SATA is proven and mature technology with very good market traction
- SATA is supported by both Windows and Linux OS
- 6GB/sec and DEVSLP support today
- SATA can fill in performance gap during 2012-2014 timeframe for high end Tablets which wish to go beyond eMMC capabilities

# Thank You