



***SD Association***



# **Optimizing User Experience with Removable Storage**

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- A global ecosystem of 1,000+ companies setting industry-leading memory card standards
- Est. 8,000+ consumer electronics models manufactured by 400+ brands worldwide rely on SD standards



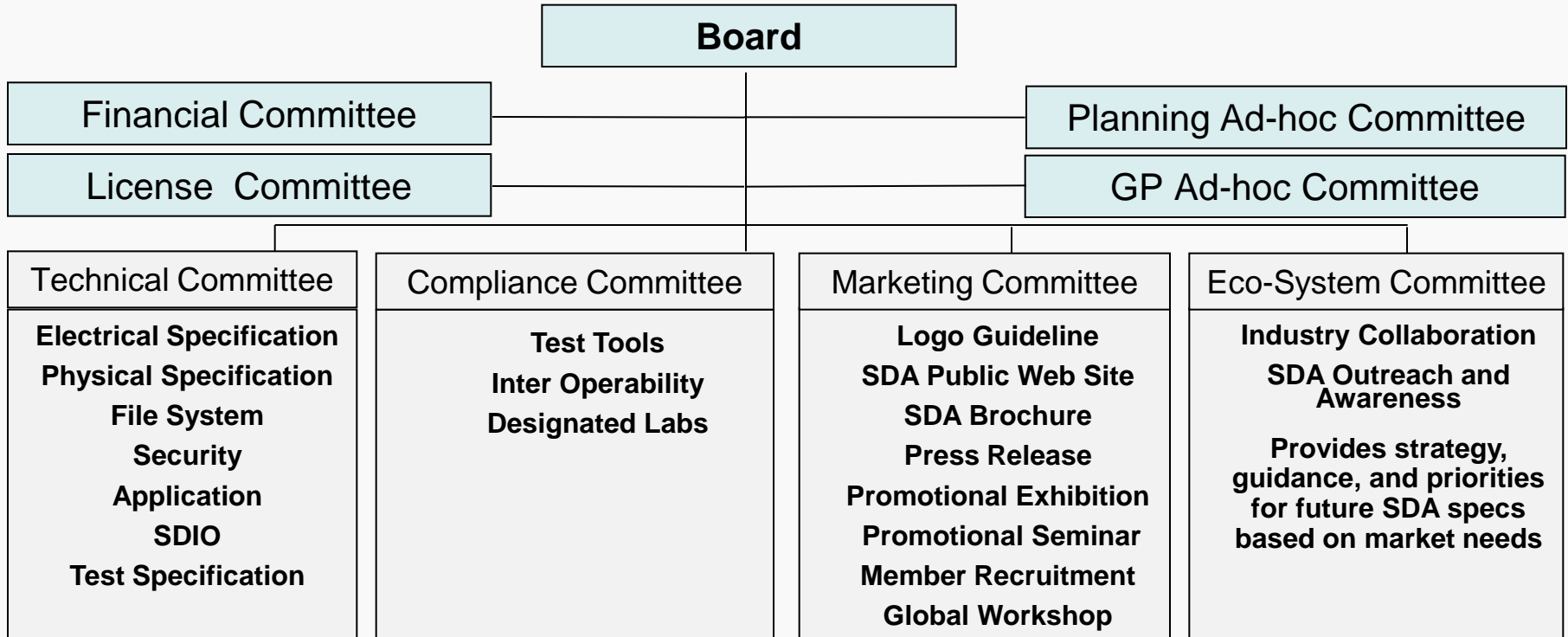
- microSD is the #1 memory card form factor for mobile devices with ~95% of mobile memory card shipments
- 78% of all mobile phone shipments have a memory card slot



# SDA Organization

## SD Association: SDA ([www.sdcard.org](http://www.sdcard.org))

- Open Standard/ SD Card Standardization
- Promotion and Adaption of SD Standard Worldwide



- **Organization Established in 2000**
- **Member Company : More than 1,000 Companies Worldwide (as of August 2013)**
- **#1 Market Share in small size memory card in the world**
- **Member Fee: Executive Member \$4,500/yr , General Member \$2,000/yr**

# SDA Board of Directors



Giesecke & Devrient



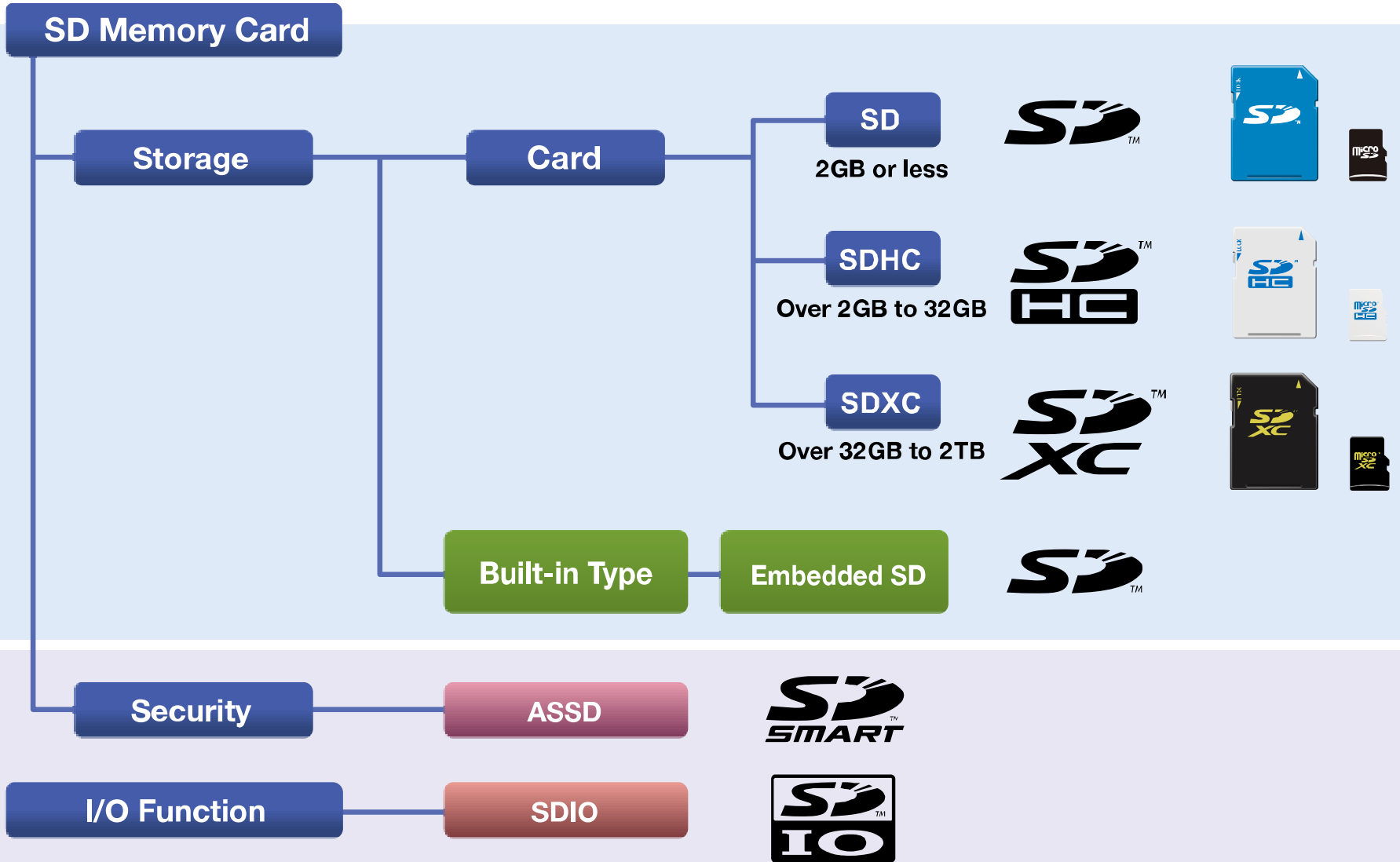
**MOTOROLA**



TOKYO ELECTRON DEVICE LIMITED



# SD Standard Overview

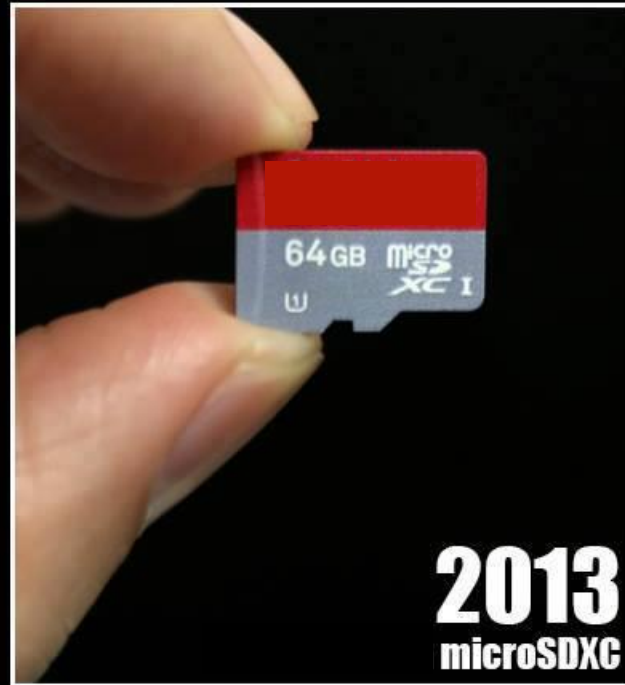


# Advances in Storage Technology

## REMOVABLE STORAGE



**5 Megabytes ... \$120,000**



**65,536 Megabytes ... \$60**

# SD Standard Direction

Capacity (and file system)

**2TB**  
(max.; exFAT)

**32GB**  
(max.; FAT32)

**2GB**  
(max.; FAT12/16)

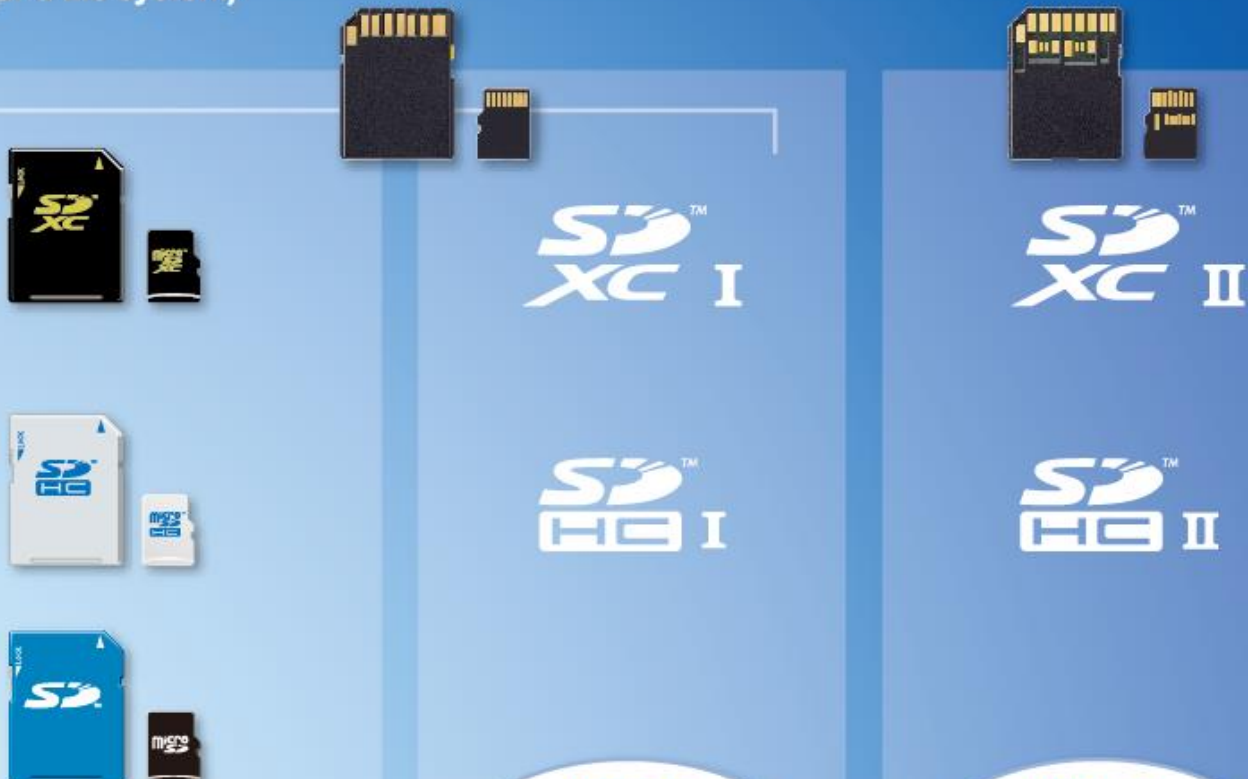
Normal speed (NS)  
12.5MB/sec

High speed (HS)  
25MB/sec

**UHS-I**  
104MB/sec  
50MB/sec

**UHS-II**  
312MB/sec  
156MB/sec

SD Bus Speed



# Market Evolution Driving UHS-II

## High Capacity / High Speed Drivers

4K DSLR/Video



4K Video Recording  
(4K videos)



Light Field Lenses  
Computational Photography



## High speed Download/Upload



>150MB/Sec



microSD



~1000MB/s

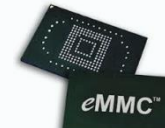


~700MB/s



~100MB/s  
(Pick)

## Matching Internal Data I/Os



~400MB/s



~2000MB/s



## Caching streamed content

- Eliminates bandwidth latency
- When no internet access available





# Market Evolution Driving UHS-II

- High Performance demand is driven mainly by the imaging market.
- High speed photography requirements are moving to Mobile Phones and Tablets (4K recording, Rapid Shots, Light field cameras...)
- Storage capacity increase dramatically (HD-Video, map, Photo, Music)
- Need to enhance side loading/uploading and multitasking user experience
- Matching card's interface speed to embedded memory and other I/Os eliminating being a bottleneck
- Battery consumption and EMI becomes more challenging
- All shall drive the adoption of higher speed SD standards

624MB/s

312MB/s

104MB/s

50MB/s

25MB/s

12MB/s



2GB



32GB



2TB



# Mobilization of Security Services



## CONTACTLESS CARD SERVICES

### REQUIREMENTS:

- Contactless capabilities
- Adequate secure element



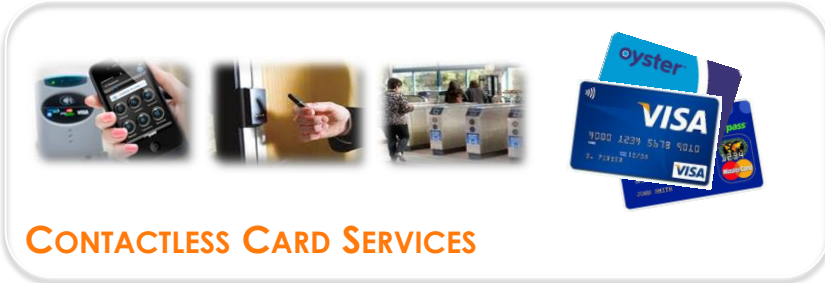
## SECURITY TOKENS



### REQUIREMENTS:

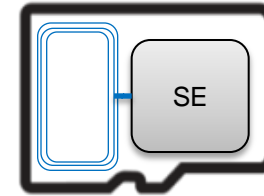
- Adequate secure element
- +/- display, etc.

# Introduction of Smart microSD with SWP interface to NFC



**New SDA Standard that will open up new markets with the addition of the Single Wire Protocol (SWP) to support NFC**

**Enables new business models that allow a removable SE using the popular uSD**



microSD with built in SE+NFC

- Antenna and SE embedded
- Global platform + JavaCard
- Proprietary solutions from various vendors (standard solution with ASSD protocol possible)
- Compatible with most phones with microSD



smart microSD with built in SE and external SWP connection to host NFC

- Global platform + JavaCard
- SWP additional pin for NFC phones
- Additional ASSD protocol
- Compatible smart microSD compliant phones
- Standardized solutions available from various vendors






# Business Independence

- Easier launch. Lower cost.
  - No need for 3rd party agreement
  - No upfront TSM integration
- Large choice of business models
  - No rental fees
  - User subsidized
  - You decide
  - May be owned and distributed by the service provider (ie, Financial Institutions)
- Differentiation
  - Full control the App and the user experience



# SmartSD compared to SIM and embedded

Solution	Legal Aspects	Issuance	Recurring Costs	Distribution	End User Privacy	Change Phone	Change MNO	Phone Plan	Applet Cert	TAM
	Avail from SmartSD suppliers	Retail, On-site, TSM, Direct mail	None. Business Independence	Any Channel	Self Controlled	Insert SmartSD into new phone	Insert SmartSD into new phone	Any type: prepaid, contract	Payment, FIPS, etc	Most current and future phones with uSD slot
	Need MNO Agreement	TSM, MNO Wallet	Per user rental + re-issuance costs (new MNO)	Channels from each MNO	Shared Customer	Use if SIM format is compatible	Re-issuance is required	SWP SIM	SIM Card	Users with NFC phones and SWP SIM from MNO
	Need Agreement with Device Manufacturer	TSM, MNO Wallet	Per user rental + re-issuance costs (new MNO)	MNO channels where phone is sold	Privacy Issues. Track access to SE and transactions	Re-issuance required	Re-issuance is required for new phone	Any type: prepaid, contract	Payment, FIPS, etc	Users with NFC phones from device vendor

# Summary

- SD Cards dominate removable card market
  - microSD slots in ~ 78% of mobile phones
  - Ideal for SmartSD Card use
  
- UHS-II enhances transfer speeds
  - Aligns well with future speed requirement trends
  
- Smart SD
  - SE in microSD - Enables new business models
  - Moving control of consumer's service applications from MNO to consumer and service providers
  - NFC Addendum - a new standard to add SWP to microSD interfacing internal SE to NFC chip