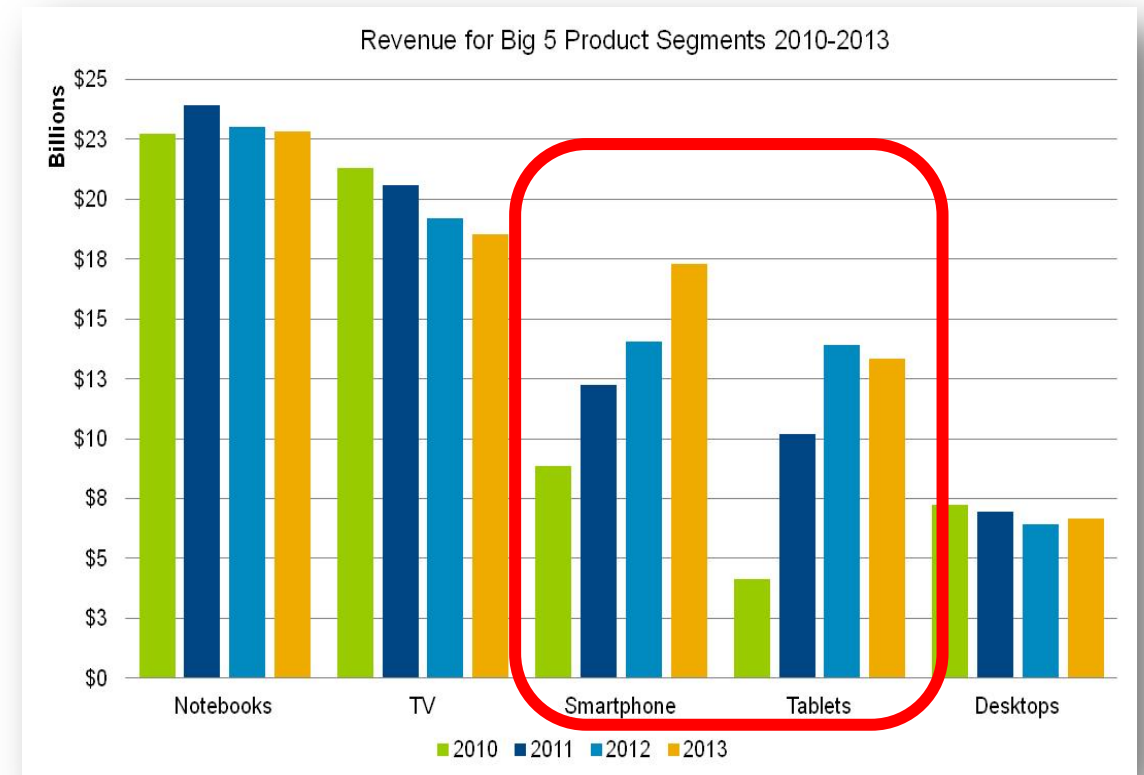# How SSDs Change The Rules of Mobility

Maciek Brzeski, VP Branded Storage
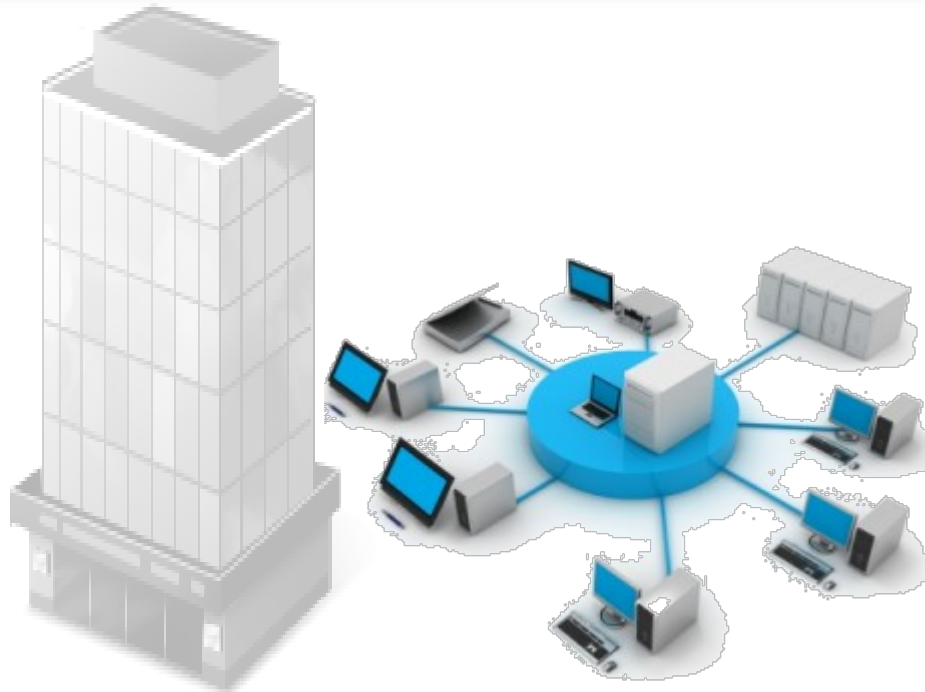
August 5, 2014

Storage Trends

- CE Trends
  - Gartner expects 276.7M PCs to ship in 2014
  - Worldwide sales of smart phones totaled 968M units in 2013
  - US Consumer spending more on smartphones and tablets in 2013 than on PCs (NPD)
- Storage Opportunities
 - Storage requirements increasing

Revenue for Big 5 Product Segments 2010-2013

Billions: $25, $23, $20, $18, $15, $13, $10, $8, $5, $3, $0

Notebooks | TV | Smartphone | Tablets | Desktops

2010 | 2011 | 2012 | 2013

Source NPD, Gartner and Toshiba

Where were we?

PORTABILITY
PCs & Notebooks

Storage

Notebook

Smartphone

Tablet

"The traditional PC category continues to decrease, with only about two-thirds of notebook and desktop replacements remaining within this category. The majority of the remaining one-third will move to ultramobiles, while others will not be replaced at all," - Ranjit Atwal, research director at Gartner. (Jan 2014)
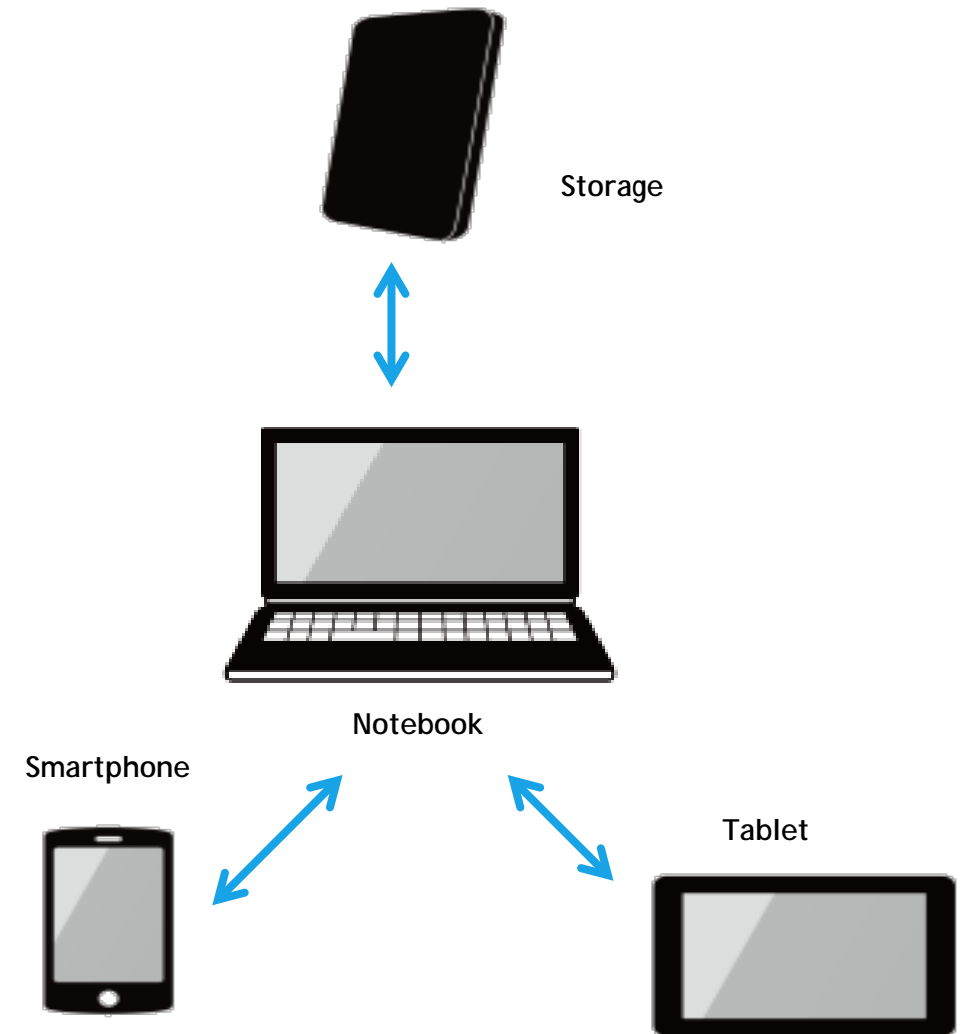
Digital Needs Are Shifting

PORTABILITY
PCs & Notebooks

MOBILITY & PERFORMANCE
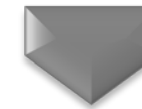### Tablets & Smartphones
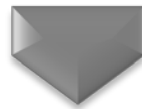
Notebooks vary in size and weight~4 to 15 lbs. (Smaller than an average desktop PC)

Flexibility to move from room to room - without wires.

Battery usage lasts between 2 to 6 hours (or more) depending on usage

Efficient tool(s) for work or school due to low power requirements. ~8 to 10 hours of battery life

Solutions that address limitations to storage capacity. Most configurations are between 8GB – 64GB

Constant internet connectivity enables instant access to email, chat & social media

IoT = Internet of Toys

**Parrot AR Drone Elite Quadricopter – Wifi
(MSRP $299.99)**

**DJI Phantom 2 Quadcopter for GoPro
(MSRP $1359.99)**

**GoPro Camera in action
(MSRP $399.95)**

**RoboME App-Enabled Robot
(MSRP $99.99)**

**Spy Rover RC Tank with Video
Camera (MSRP $89.99)**

- Price ranges vary anywhere from $20 - $2,000

Sharing Content On The Go

YOUR AR.DRONE IN THE CLOUD

Live data from registered pilots

USERS	FLIGHTS	HOTSPOTS	TOTAL FLIGHT TIME
189 059	3 207 847	4 575	11Y 147D 5H 9M 26S

RECORDS

MAX SPEED	MAX ALTITUDE
11.11m/s	199.03m

MEDIA SHARING

PICTURES	VIDEOS
11 831	22 936

PARTICIPATING FLIGHTS

COUNTRIES		
199	1. US:	579 284
	2. FR:	183 552
	3. DE:	150 981
	4. IT:	112 685
	5. GB:	95 749

1080P is twice the size of 720P

TOSHIBA
Leading Innovation >>>

Left panel

Parameters

INPUT / SOURCE

HD: 1080p – 720p

Examples   Red: 4K – 3K – 2K

Width / height   1280   720

Colour depth   bits/colour

Frame rate   25.000p (TV/PAL) | Custom:

Duration   60   seconds

[Calculate!]

Calculation

Dimensions
- Megapixels: **0.9** (921,600 pixels)
- Aspect ratio: **1.78** – HD 16:9

Frame filesize
- Uncompressed RAW: 1.4 MB (12-bit/pixel)
- Uncompressed RGB 8-bit: 2.8 MB
- Uncompressed CMYK 8-bit: 3.7 MB

Estimation of bitrate for various levels of quality / compression
- Uncompressed: 69.1 MB/sec (25.00 fps – 8-bit)
- ± 'Prores422 HQ': 12.2 MB/sec (1080p25 = 220Mbps)
- ± 'JPEG2000': 6.8 MB/sec (2Kp48 = 31.25 MB/s)
- ± 'MPEG2 High': 4.2 MB/sec (1080p25 = 10MB/s)

Video filesize for 1,500 frames of video material
- 8-bit RGB sequence: 4.1 GB
- ± 'JPEG2000': 406.9 MB
- ± 'MPEG2 High': 250.0 MB

Right panel

Parameters

INPUT / SOURCE

HD: 1080p – 720p

Examples   Red: 4K – 3K – 2K

Width / height   1920   1080

Colour depth   bits/colour

Frame rate   25.000p (TV/PAL) | Custom:

Duration   60   seconds

[Calculate!]

Calculation

Dimensions
- Megapixels: **2.1** (2,073,600 pixels)
- Aspect ratio: **1.78** – HD 16:9

Frame filesize
- Uncompressed RAW: 3.1 MB (12-bit/pixel)
- Uncompressed RGB 8-bit: 6.2 MB
- Uncompressed CMYK 8-bit: 8.3 MB

Estimation of bitrate for various levels of quality / compression
- Uncompressed: 155.5 MB/sec (25.00 fps – 8-bit)
- ± 'Prores422 HQ': 27.5 MB/sec (1080p25 = 220Mbps)
- ± 'JPEG2000': 15.3 MB/sec (2Kp48 = 31.25 MB/s)
- ± 'MPEG2 High': 9.4 MB/sec (1080p25 = 10MB/s)

Video filesize for 1,500 frames of video material
- 8-bit RGB sequence: 9.3 GB
- ± 'Prores422 HQ': 1.7 GB
- ± 'JPEG2000': 915.5 MB
- ± 'MPEG2 High': 562.5 MB

Understanding Today's Model

MOBILITY & PERFORMANCE
Tablets & Smartphones

SHARE/STREAM
Facebook, Tumblr,
Instagram, Flickr,
Spotify, Pandora …

Smartphone

Tablet

KEEP
Photos
Videos

"Meanwhile users continue to move away from the traditional PC (notebooks and desk-based) as it becomes more of a shared content creation tool, while the greater flexibility of tablets, hybrids and lighter notebooks address users' increasingly different demands." - Ranjit Atwal, research director at Gartner. (Jan 2014)
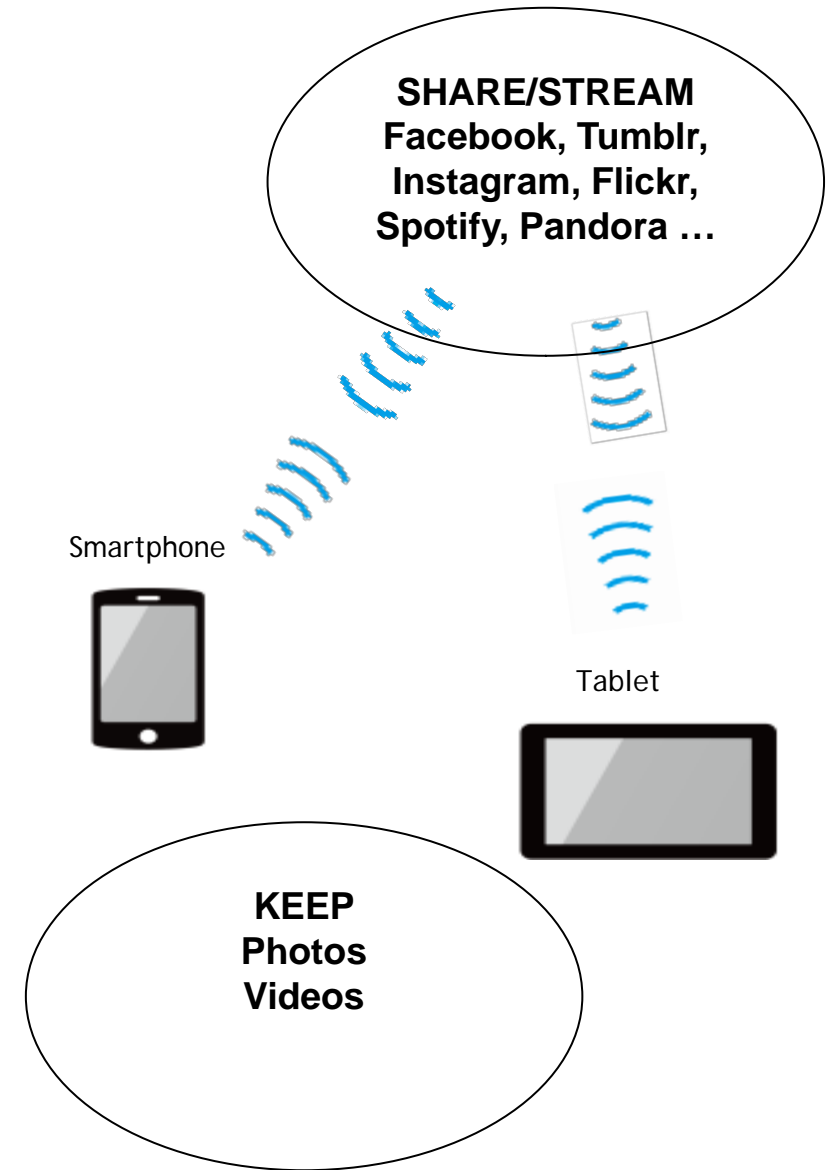
Pain Points (Dollars and sense)
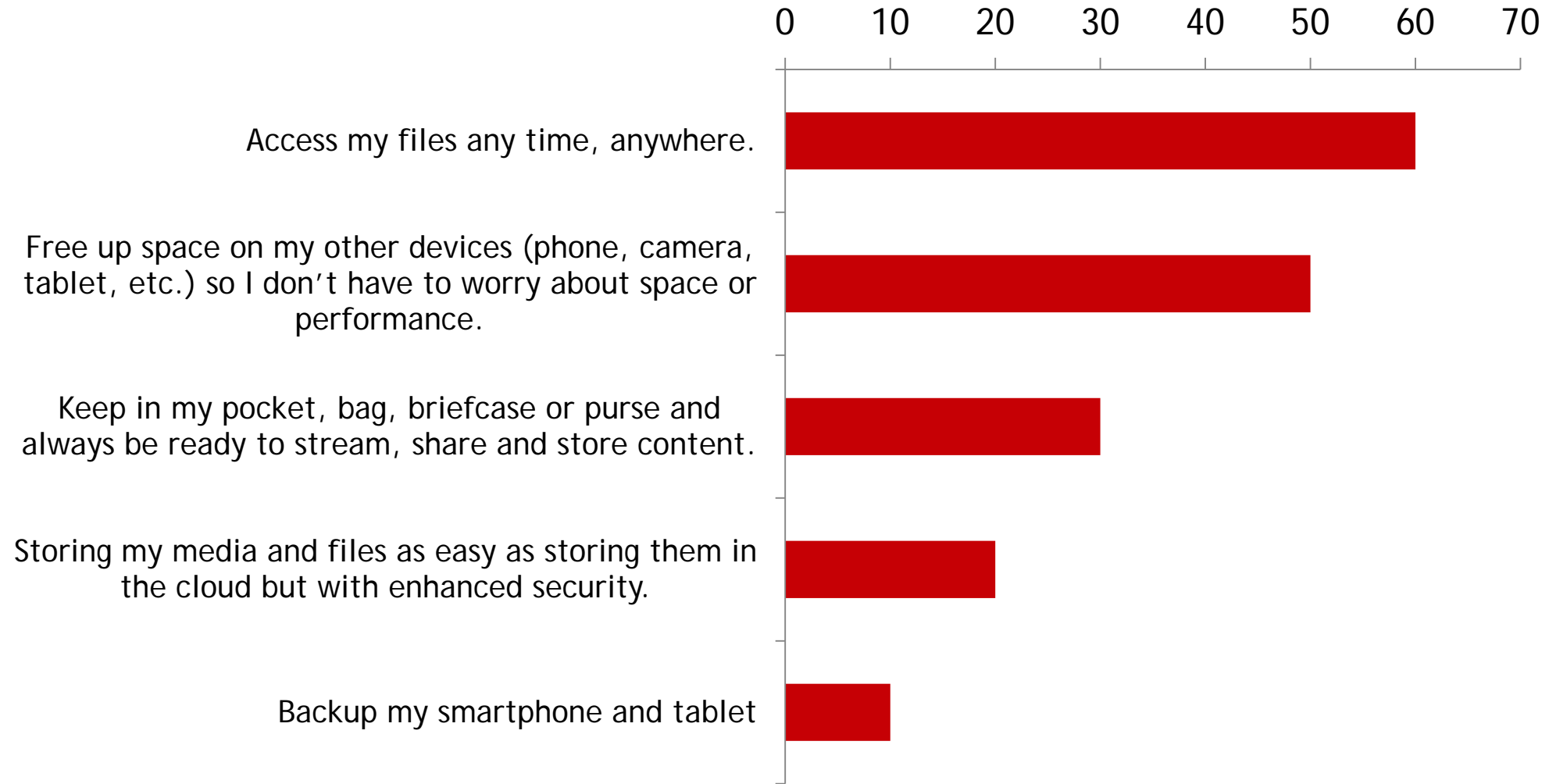
- Consumer struggles:
  - Unable to carry everything with you
    - Cost per GB on the phone
  - Unable to store all content on the cloud
    - Cost per GB on the cloud
  - User experience on the cloud
    - Access and share control
    - Consistency of service

  - Run out of space on your mobile device
  - Need to delete before taking more pictures/movies

Understanding Today's Model

MOBILITY & PERFORMANCE
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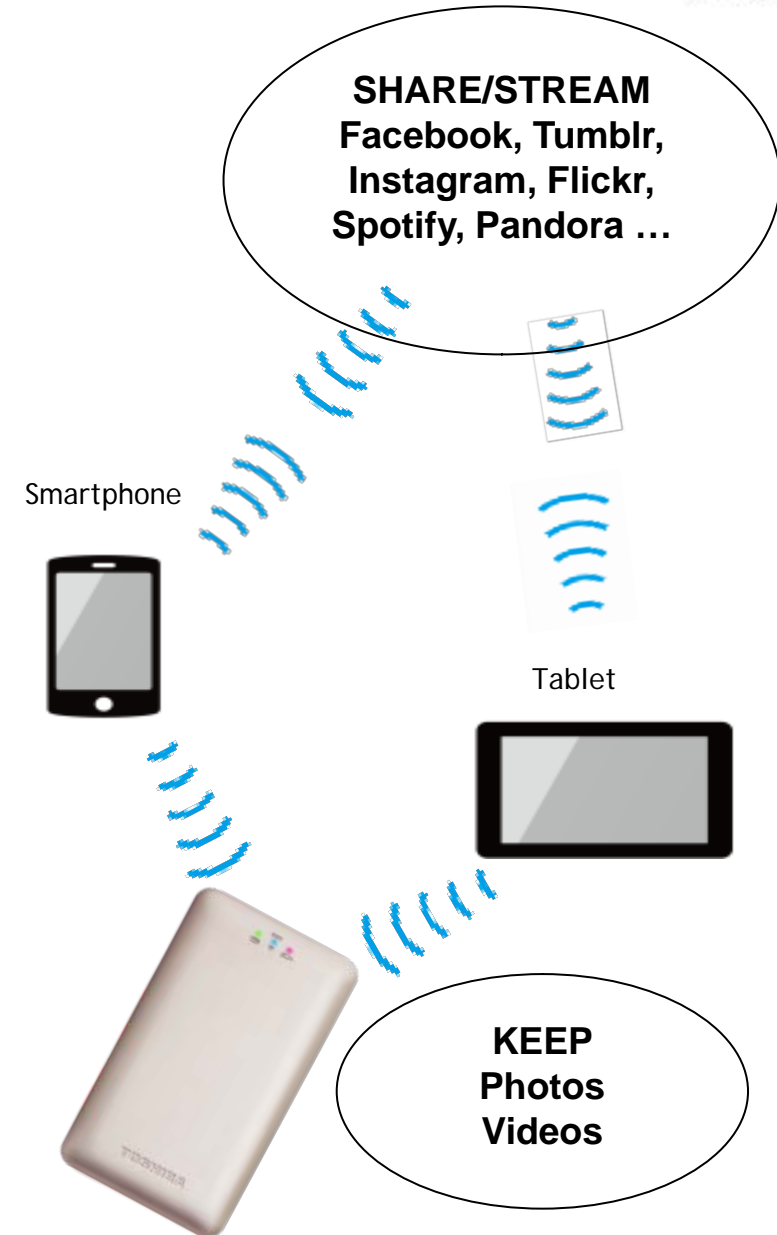
MOBILITY AND CONVENIENCE

- Discussions regarding SSDs typically revolve around PC performance, but times are changing …

- Consumer needs are shifting:
  - Consumers want quick, easy, on-the-go solutions to access
  - Storage devices that support mobile devices such as smart phones & tablets
  - Share photos & videos from mobile devices

- Spec requirements:
  - Wireless
  - Battery operated
  - Storage capacity & speed

- SSDs fit the bill

Canvio AeroMobile Wireless SSD

Features

- Wireless access and share
  - Integrated wireless functionality and rechargeable battery for accessing your content on the go
  - Stream music, photos and videos to your PC, Mac®, tablet or smart phone
  - Share your favorite media with multiple users at one time (connects up to 8 devices simultaneously)
  - Internet Pass-Through mode allows you to access the web while still connected to Canvio® AeroMobile™
- Store more on the go
  - 128GB Solid State drive
  - Built-in SD card slot for expanded storage and easy photo backup
- Pocket-sized, lightweight and easy to carry
  - Less than half an inch thin
  - Weighs a mere 4.2 ounces
- Superb reliability & performance
  - No-moving-parts construction resists shock and vibration
  - Fast and direct data transfer with solid state drive speed and performance
  - Up to 8 hours of battery life for video streaming
  - Free up storage space on your mobile devices
- Broad compatibility
  - Works with PC, Mac®, Android™ and iOS mobile devices

Reference Information (Slide 1)

Worldwide sales of smartphones to end users totaled 968 million units in 2013, an increase of 42.3 percent from 2012 (see Table 1), according to Gartner, Inc. Sales of smartphones accounted for 53.6 percent of overall mobile phone sales in 2013, and exceeded annual sales of feature phones for the first time.

Table 1

Worldwide Smartphone Sales to End Users by Vendor in 2013 (Thousands of Units)

Company	2013 Units	2013 Market Share (%)	2012 Units	2012 Market Share (%)
Samsung	299,794.9	31.0	205,767.1	30.3
Apple	150,785.9	15.6	130,133.2	19.1
Huawei	46,609.4	4.8	27,168.7	4.0
LG Electronics	46,431.8	4.8	25,814.1	3.8
Lenovo	43,904.5	4.5	21,698.5	3.2
Others	380,249.3	39.3	269,526.6	39.6
Total	**967,775.8**	**100.0**	**680,108.2**	**100.0**

Source: Gartner (February 2014)

- http://www.gartner.com/newsroom/id/2665715

Worldwide Device Shipments by Segment (Thousands of Units)

Device Type	2013	2014	2015
Traditonal PCs (Desk-Based and Notebook)	296,131	276,221	261,657
Ultramobiles, Premium	21,517	32,251	55,032
PC Market Total	**317,648**	**308,472**	**316,689**
Tablets	206,807	256,308	320,964
Mobile Phones	1,806,964	1,862,766	1,946,456
Other Ultramobiles (Hybrid and Clamshell)	2,981	5,381	7,645
Total	**2,334,400**	**2,432,927**	**2,591,753**

Source: Gartner (June 2014)

- http://www.computerworld.com/s/article/9247218/_PC_sales_to_drop_by_6_in_2014

Computerworld - The global decline in sales of laptops and desktops is nothing new, and Gartner today forecast a 6% drop in 2014 compared to last year -- and it envisions *another* decline of nearly 5% in 2015.

Gartner expects 276.7 million PCs to ship to retailers in 2014, a figure that will slip further to 263 million units in 2015. In recent years, two-thirds of laptop and desktop owners have replaced their hardware with updated models; of the remaining third, most replaced their old machines with tablets and tablet hybrids, with a smaller number not buying replacements of any kind, said Ranjit Atwal, a Gartner analyst.

- http://techcrunch.com/2014/07/06/gartner-device-shipments-break-2-4b-units-in-2014-tablets-to-overtake-pc-sales-in-2015/

2013 was the year when the inevitable happened: worldwide sales of smartphones surpassed sales of the more basic (and generally cheaper) feature phone devices for the first time, according to Gartner's latest market estimates – with 968 million smartphone device units sold to end users in 2013 out of a total of 1.8 billion mobiles sold.

That overall global mobile device total was up 3.5% on 2012's figure.

- http://techcrunch.com/2014/02/13/smartphones-outsell-dumb-phones-globally/