Is there room for everyone?
—Mutual stimulus vs. direct competition in digital storage for CE

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Outline

• Growth in Flash and HDD storage
• Flash vs. HDD price parity with time
• Where will flash win, where will HDDs win?
• Conclusions
• Storage in flash-based devices is usually ancillary to storage on a HDD, e.g. a computer downloads content that is then loaded on an MP3 player
• Long term accessible storage will remain on hard disk drives and hard disk drive enabled storage networks
• Having many storage choices will create multiple market niches serving multiple clients

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Comparison of Price vs. Capacity of HDDs and Flash in 2006

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Minimum 1-Inch Drive Capacity as a Function of Areal Density CAGR and Flash vs. HDD Cross-Over Price Point vs. Time
Higher Resolution Mobile Device Storage Needs
(HDD’s Still Have a Role)

- A pure 4-MPixel photo viewer with 20,000 maximum images has 20 GB
- A combination camera and photo viewer with 8 MPixel Resolution and 20,000 images has 40 GB
- A 10,000 song MP3 player has 40 GB
- A 10,000 song loss-less compression player has 140 GB
- A 10,000 CD quality song player has 280 GB
- A 100 movie player at VGA resolution has 70 GB
- A 100 movie player at DVD resolution has 417 GB

- A combination 20k 4-Mpixel photo, 10k MP3 song, 100 VGA movie player has 130 GB
- A combination 20k 8-Mpixel photo, 10k loss-less compressed song, 100 DVD movie player has 597 GB
1 Disk/2 Head Capacity vs. HDD Form Factor (50% A.D. CAGR) and Flash Memory for ~$55 OEM

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Extended Projection Showing the Impact of Life-Logs on Personal Content Generation in a Technology Savvy Home.

Capacity (GB)

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Mobile CE Product Market Niches
(e.g. cell phones)

Market Volume

Flash or HDD
- Moderate storage needs
- Features and environmental factor trade-offs

HDD Only
- Rich media
- Convergence device
- High storage needs
- Highest margins

Flash Only
- Lower storage needs

Price/Features

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HDD Projections
(Coughlin Associates, 2006)

Market Niches

Form Factor

Majority of HDDs in CE and mobile computers by 2010

Majority of HDDs in 2.5-inch or smaller by 2010
Conclusions

• Growth for flash and HDDs. Room for all!
• To play a continuing role in mobile CE very small HDDs must have Areal Density CAGR’s exceeding 80%.
• Flash will serve to gather digital content that will ultimately be stored on larger form factor HDDs
• Some applications will require more storage than flash can provide for the price—this is role for HDDs in mobile devices
• Storage demand for CE applications is unlimited—1 TB in your pocket and 1 PB in your home by 2020!
• Multiple product niches enabled by choices in digital storage devices in CE products
Thank You!