Potential Application of Solid State Drives in NetBooks

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Outline

• Background on solid state drives
• Overview of Netbooks
• Inadequacy of using hard disk drives
• Advantages of using solid state drives
  – Short Access Time
  – Weight
  – Superior Kinetic Shock Resistance
• Disadvantages of using solid state drives
  – Price
  – Amount of Data Storage
• Summary
Background on Solid State Drives

• *Solid State*?

• Made of *flash memory*
  – Non-volatile
  – Fast read access time

• Not to be confused with other kinds of solid state drives
  – E.g. SRAM, DRAM, USB flash drive
Overview of Flash Memory

• Representation of 0/1
  – By type of charge stored in the float gate
  – Charge -> Current

*Diagram from www.wikipedia.org
Overview of Flash Memory

• Reading data
  – + Voltage on bit line
    Ground source line
  – Negatively charged float gate
    • No flow of current
  – Positively charged float gate
    • Flow of current
Overview of Flash Memory

• Writing data
  – Ground source line
    + Voltage on bit line
    + Voltage on Control Gate
  – Electrons move into float gate with quantum tunneling effect
  – To remove, electrons, negative voltage
Overview of NetBooks

- Ultra-portable laptop computers
- Priced under $500
- CPU, Storage, RAM
  - Inferior to other laptops
- Weighted between 0.90 kg ~ 1.50 kg

*Diagram from www.wikipedia.org
Inadequacy of Using HDD* for NetBooks

• Slow access time
  – Access time for HDD
    = spin up time
    + seek time
    + rotational delay
    + transfer time
• Cannot withhold too much vibration
• Noise
• Heat

*Diagram from www.wikipedia.org
*This analysis of HDD is applicable only for 2.5” HDD.
Advantages of using SSD

• SSD has no moving parts.
• Weight
• Short Access Time
• Superior Kinetic Shock Resistance

*Photograph from opussolution.net
Weight
HDD vs SSD

*Data found from www.amazon.com*
Short Access Time of SSD

Access time for HDD

= spin up time
  + seek time
  + rotational delay
  + transfer time

Access time for SSD

= spin up time
  + seek time
  + rotational delay
  + transfer time
Average Read Transfer Performance

HDD vs SSD

*Data found from www.tomshardware.com*
**Average Write Transfer Performance**

**HDD vs SSD**

- **Mb/s**
  - HDD: 95, 57
  - SSD: 120, 140

- **40% faster**

*Data found from www.tomshardware.com*
Withholding Vibration (HDD)

- Head is close to rotating platter
  - 70 nm to 200 nm
- Platter is rotating at a high speed
- A thin film of high air pressure builds up
- Head lifts up
Withholding Vibration (HDD)

• When the hard drive is shaken,
  – Temporal imbalance in air pressure
  – Lift < weight
    • Head crash!
• Consequences of head crash
  – Parts of platter become unusable
  – Damaged head
  – Dust particle created within the hard drive
Withholding Vibration (SSD)

- Contains no moving parts
- Very little chance of causing failure
Disadvantages of using SSD

- Price
- Amount of data storage
Price

*Data from www.pricewatch.com and www.pricewatch.com*
Amount of Data Storage

**SSD**
- 32 Gb maximum
  - Due to price constraint of NetBook
    - Under $ 500
- Mostly 8 Gb and under

**HDD**
- Wide range of choice
  - 160 ~ 250 Gb for higher end products
  - 120 Gb and under for mid-range and low end products
Summary

• Background on HDD, SSD and Netbook

• Advantages of using solid state drives
  – Short Access Time
  – Weight
  – Superior Kinetic Shock Resistance

• Disadvantages of using solid state drives
  – Price
  – Amount of Data Storage
Conclusion

• Hard disk drives inadequate for NetBooks
• Solid state drives as ideal storage device
  – Short Access Time
  – Weight
  – Superior Kinetic Shock Resistance