Solid State and Rotating Media
Battle moves beyond CE

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Storage Industry Predications

- Users have a limitless demand for storage

- Users want 30-100% more bits each year for the same price

- Technological innovation = Price per bit reduction

- Anything that adds cost is a non-starter

- Build it and they will come

Computing Reality

- I/O is the bottleneck to computing performance

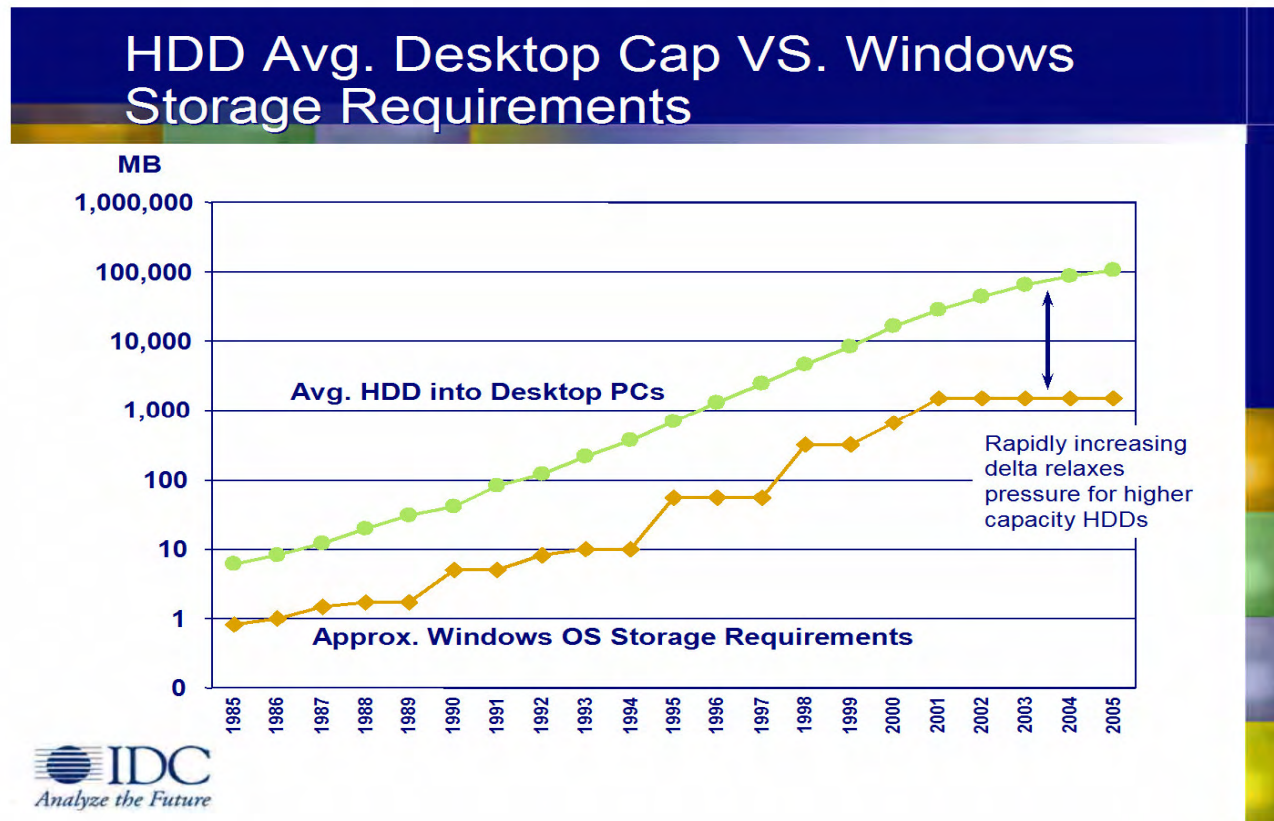- Power consumption per unit of performance is becoming the industry's benchmark

» **Result**

- Where the predication is true, NAND will cache HDDs

- Clear returns exist from converting 0.25% - 20%
  » Hybrid Hard Drive / ReadyDrive, ReadyBoost

- Once the predication breaks down, the conversion to solid state is inevitable

How do users consume all this space?

» **OS & Applications? – No**

- Static requirements – periodic step functions

Source: IDC, Spring/06

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» **OS & Applications? – No**
- Static requirements – periodic step functions

» **Unique user data? - No**
- Don's HDD - 12GB of unique user data on it
  » Every email, document, picture created, sent or received since 2000; growing at ~3GB/yr
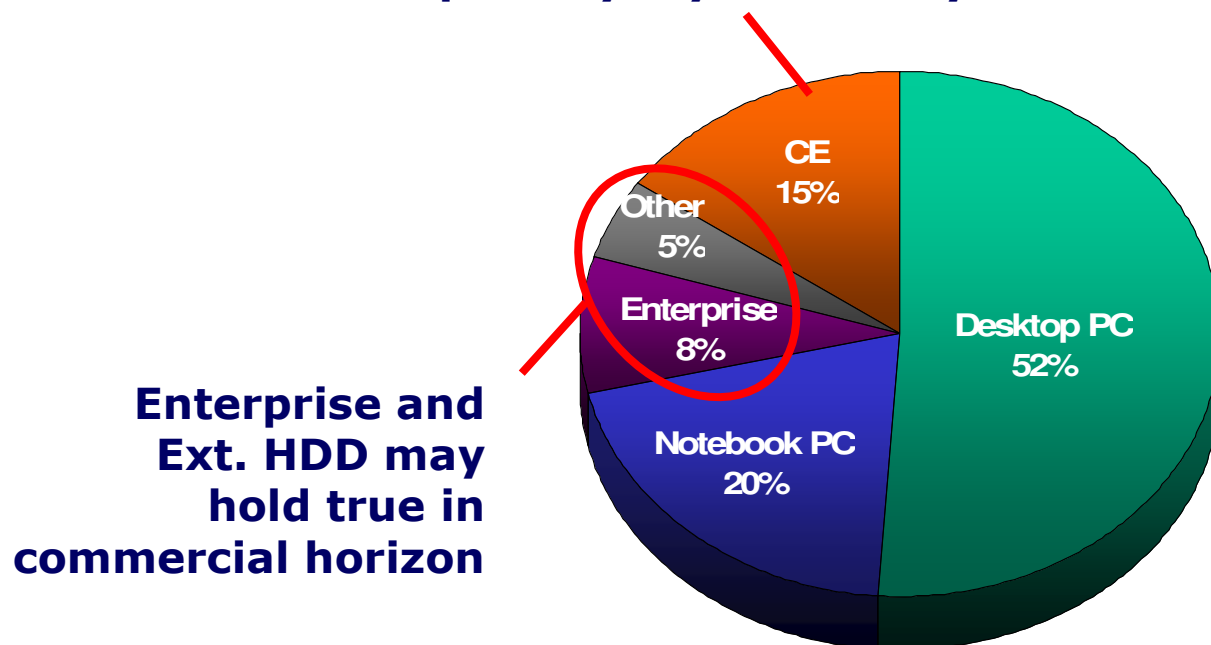
» **Media Files? - No Question**
- 4MB per MP3, 1GB per movie (SD)
- Easy to see personal libraries in the 100s of GB

» **Which HDD segments follow the Predication?**

HDD Industry Segmentation

CE limits density growth in two ways
- **Content bit rate: fixed by screen and audio**
- **Content quantity: by the ability to search (interface)**

Enterprise and Ext. HDD may hold true in commercial horizon

CE 15%

Other 5%

Enterprise 8%

Desktop PC 52%

Notebook PC 20%
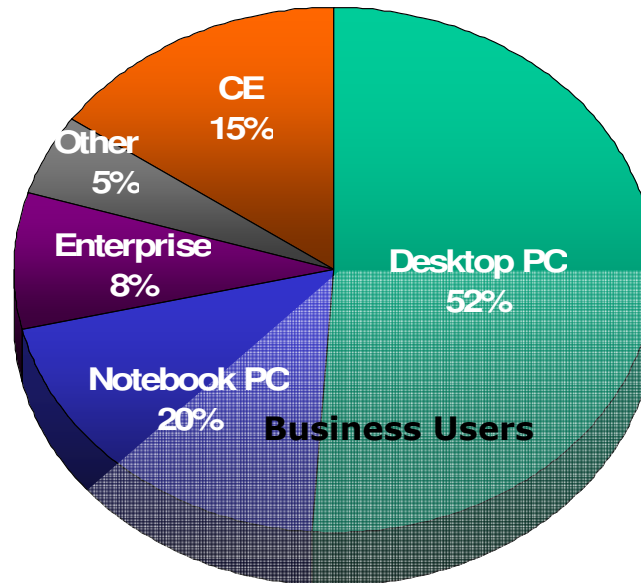
2005: 380M drives, $26B revenue

Source IDC, Q1/06

HDD Industry Segmentation

Business users do not fit the storage predication
- **Little to no media file content**
- **IT department wants user data stored on network**

Not a clear need for more than 32GB of storage in next 5 years

2005: 380M drives, $26B revenue

Result

» **Basis of HDD industry begins to show wear**

- Customers forced to take bits they don't need
- Aerial Density scales ahead of demand drivers

» **Result: Broader, more rapid migration to NAND**

- Where predication holds true
    » NAND cache replaces 0.25% to 20% of HDD bits
- Where predication is false
    » NAND replaces HDD as soon as TCO economics allow

» **Prediction:**

- Portable CE – HDD gets squeezed out of high end
    » Do you really want a 1TB iPOD?
- Business desktop & notebook primarily SSD before 2010

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