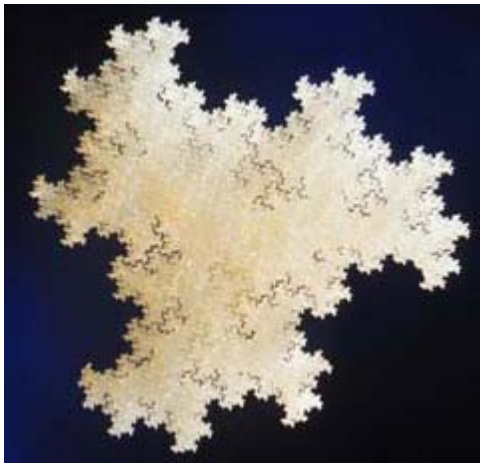


Entertainment Storage Market

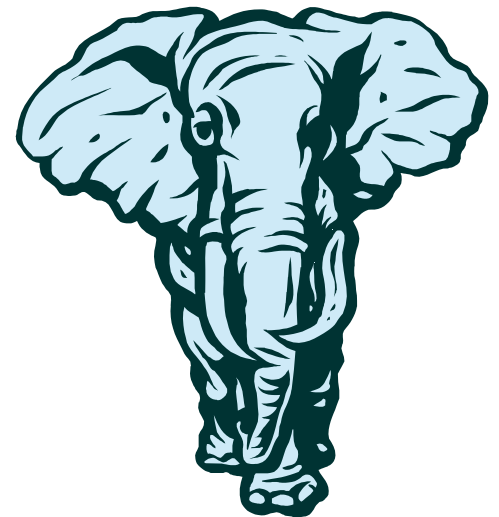
Tom Coughlin
Coughlin
Associates





Outline

- Content Drives Storage Requirements
- Storage Costs
- Storage Device Projections
- Conclusions



Drivers for Storage Growth



- Growth in digital information from faster processors and the digitization of human content (from literature, audio, and video to our genes)
- Ever lower cost of digital data storage
- Increasing availability of high data rate access
- New applications inspired by low cost that generate even more digital information

Content Based Storage Requirements

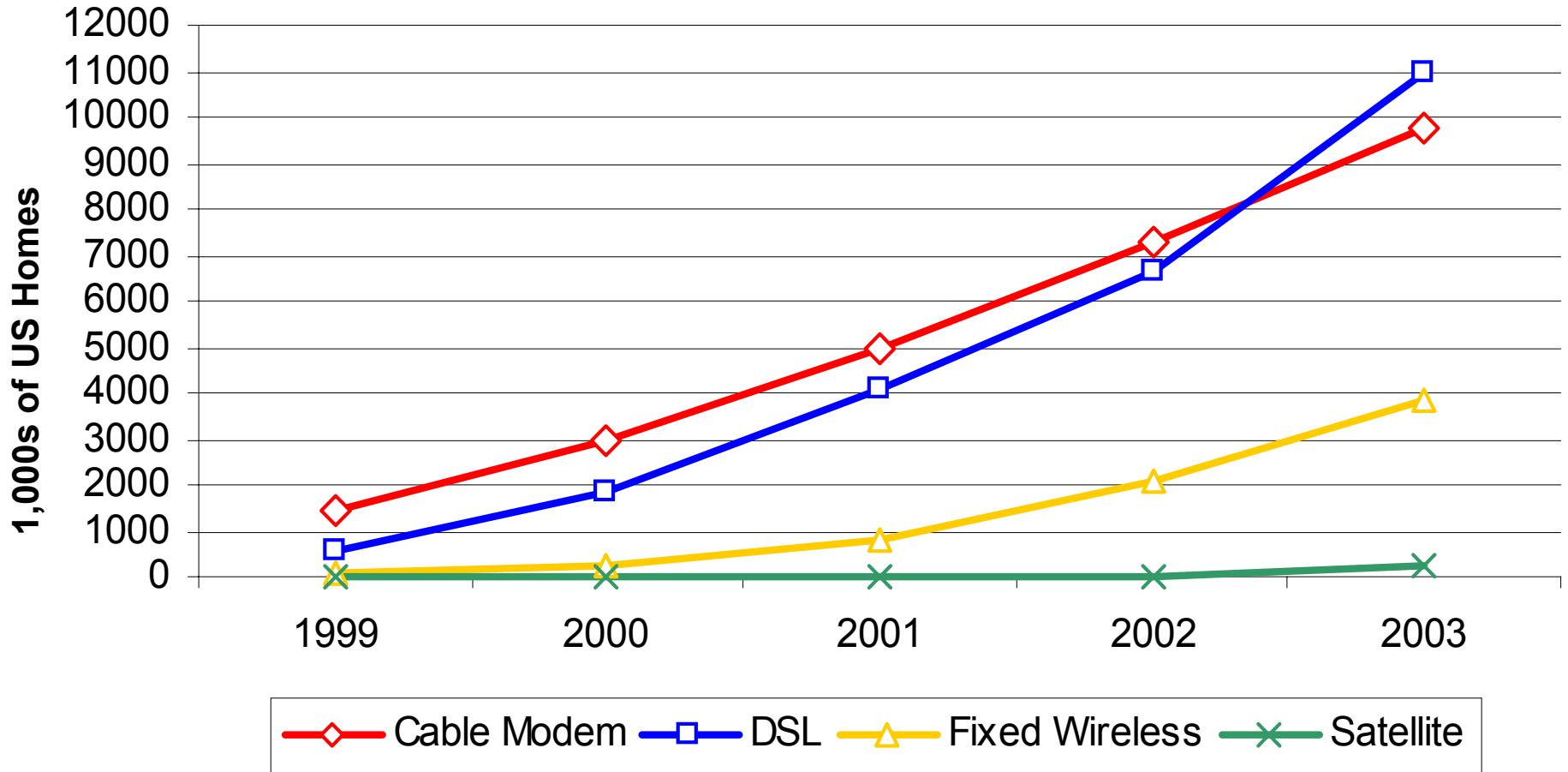
Commercial Video

- ~1 TB is required for a digital theater complex
- ~800 TB may be required for single movie production
- Including TV, movie, commercial production, and video distribution the annual video production storage market may be **740 PB by 2006**

Personal Video

- 50 years of MPEG-2 quality digitized television content is estimated to require 912 PB by 2006
- With 10% utilization this would result in about **91 PB downloaded/year**
- With mirroring this on-line content might require **3.6 EB by 2006**

US Broadband Projections



As of June 1, 2001 8.2% US household penetration, Canadian penetration was 15%

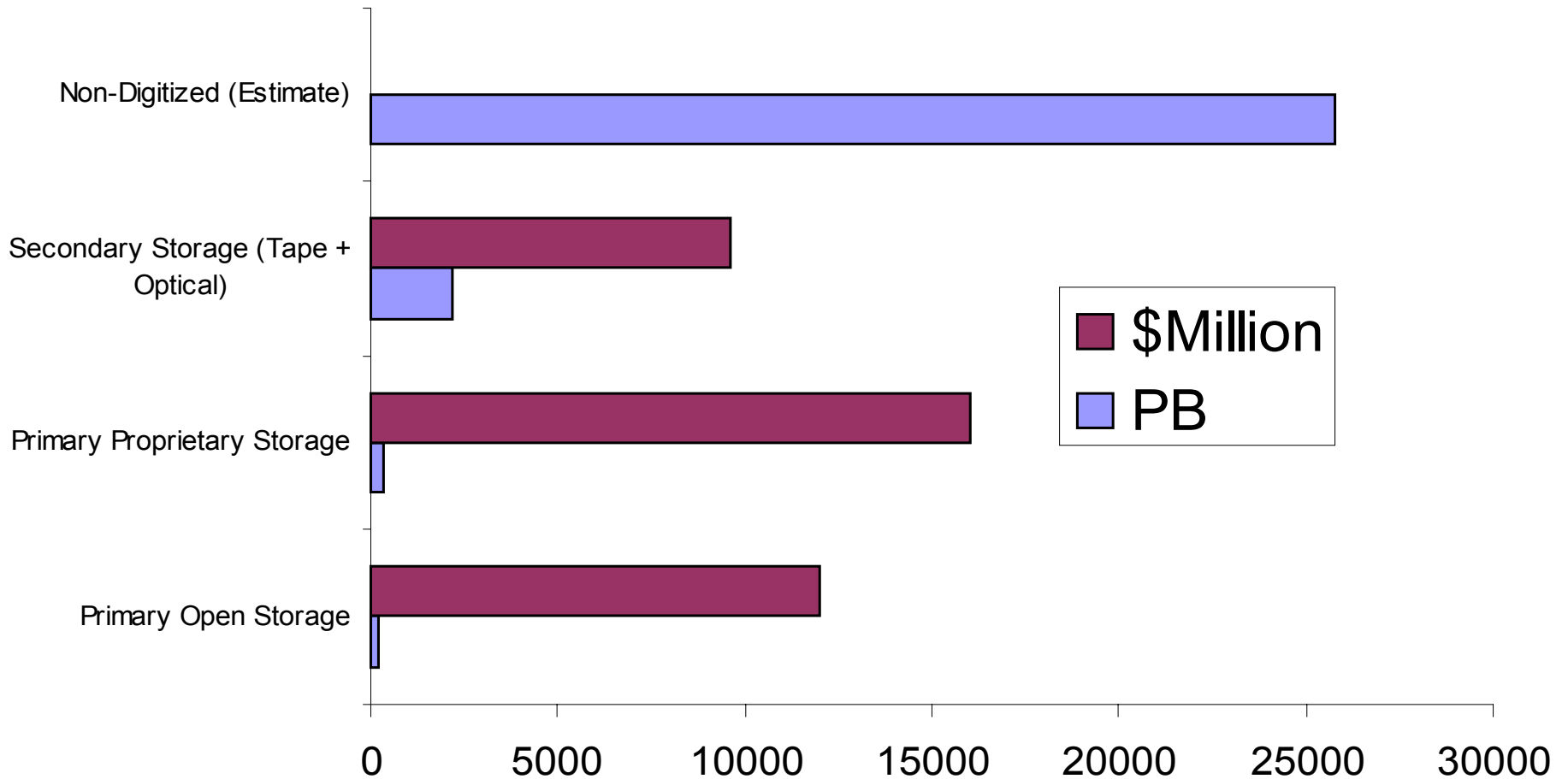
Source: eMarketer, 2000

Non-Digitized Information

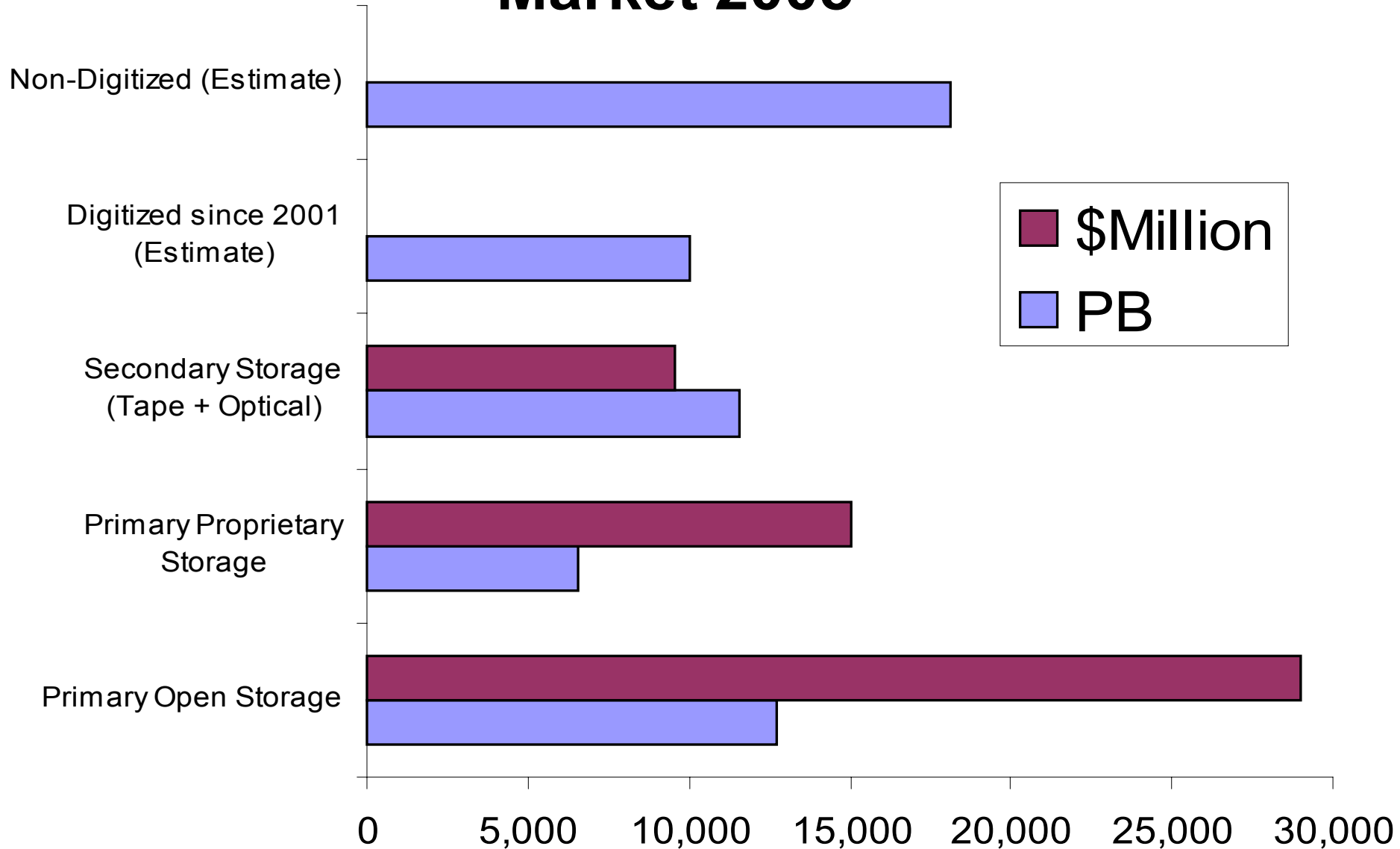
- Photographs (includes personal, x-ray, astronomical)
- Analog Video
- Analog Audio
- Historical Scientific data
 - Geological & Meteorological Data
 - Astronomical Data
- Books and other documentation
- Genetic code and other biological information



Total Network Information Storage Market 2001

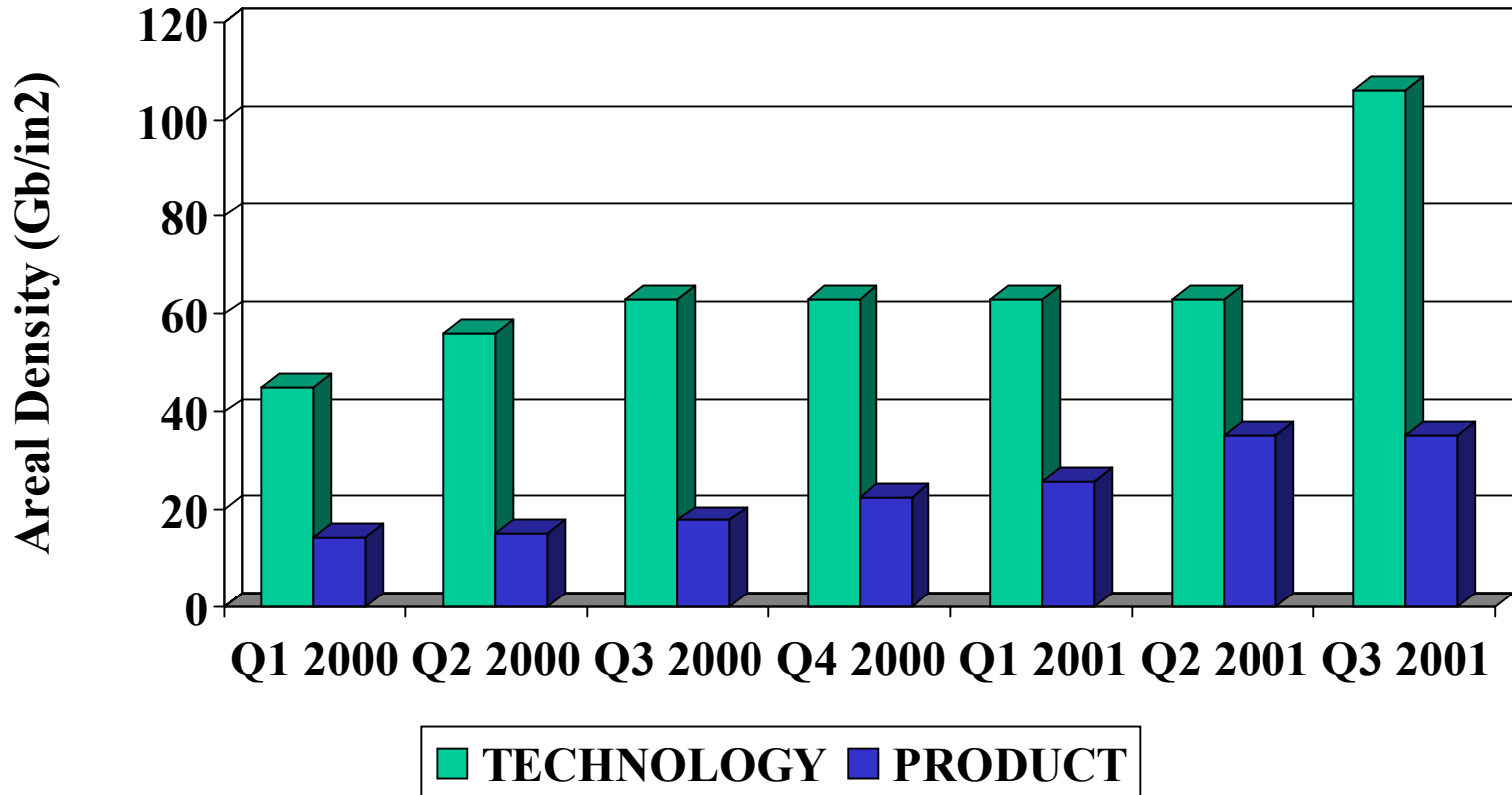


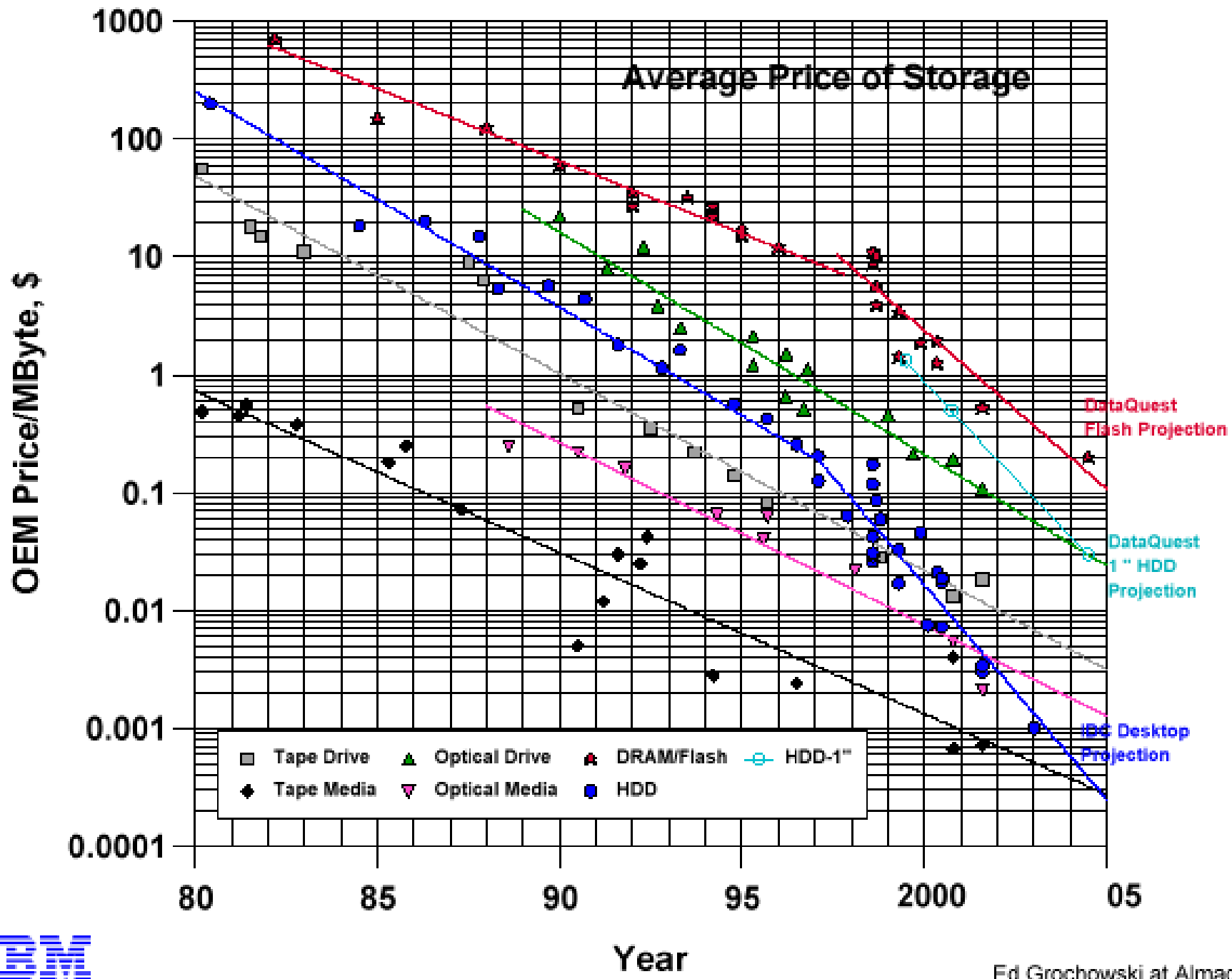
Total Network Information Storage Market 2005



AREAL DENSITY PROGRESSION

(Source: PRC, 2001)





oemprc2001ab.prz



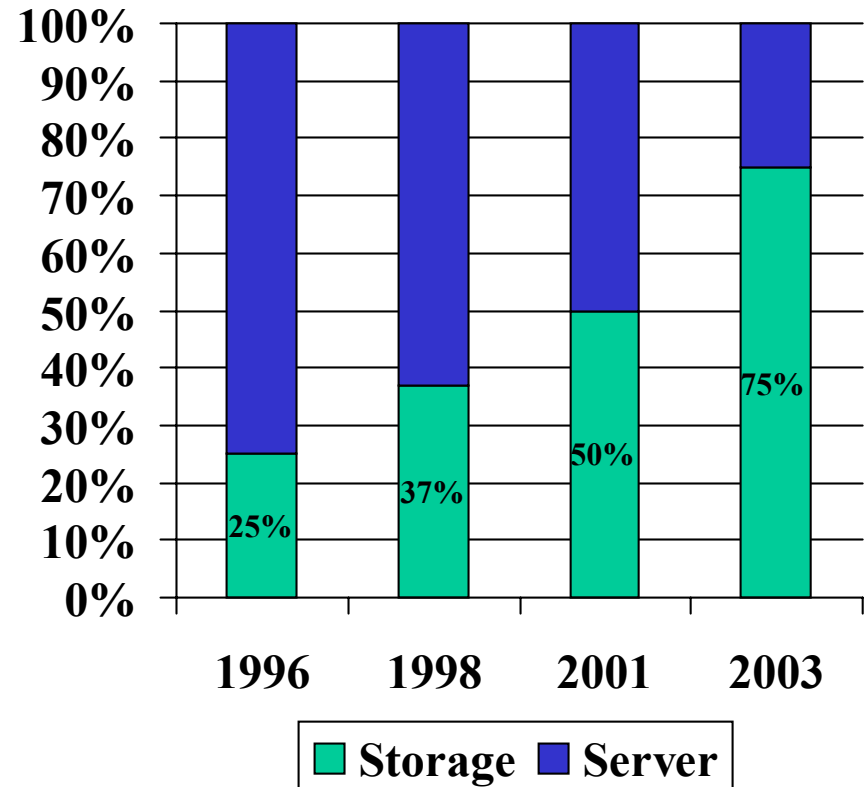
Ed Grochowski at Almaden

The Case for Inexpensive Network Storage



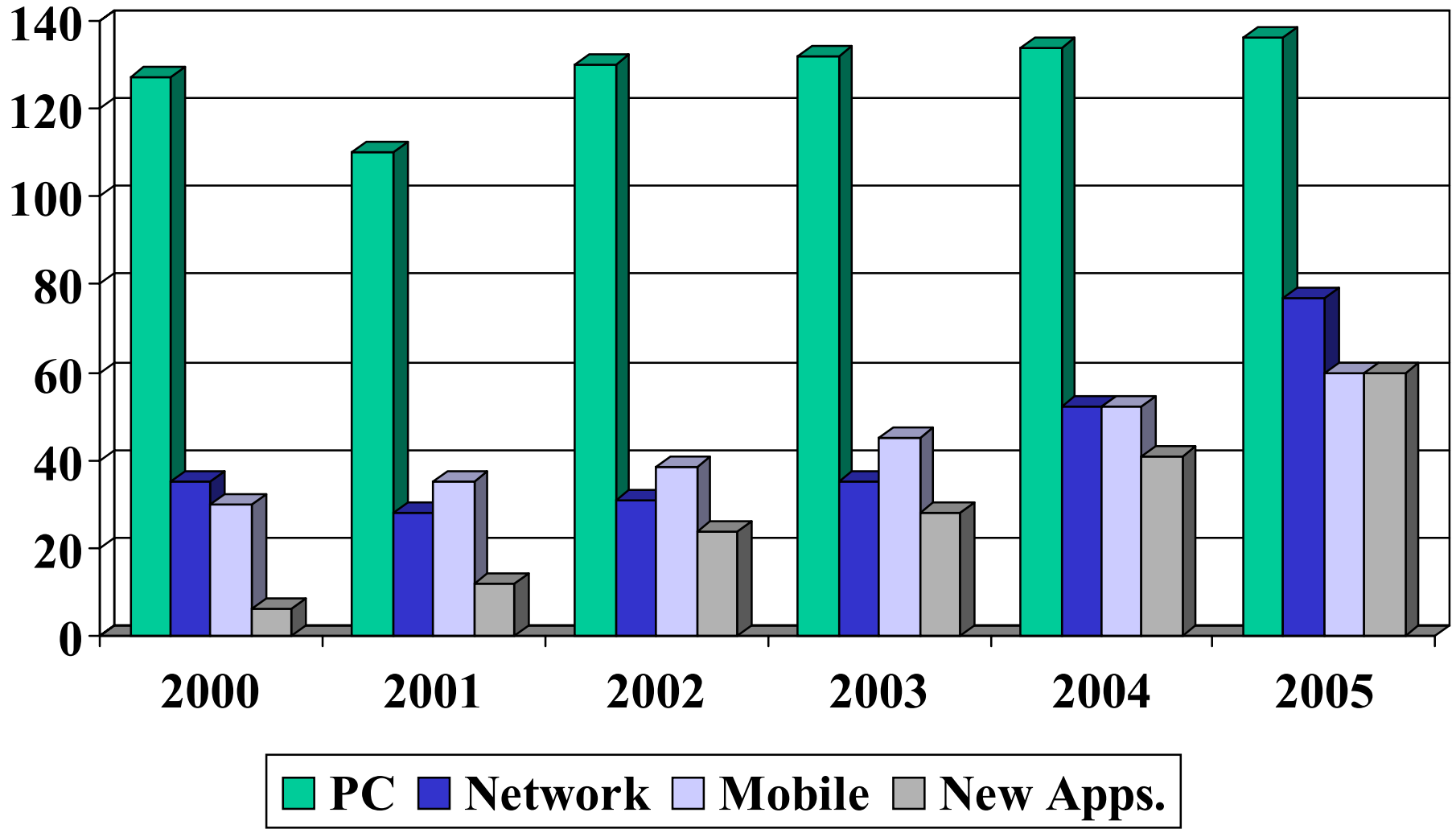
- Storage is becoming the largest IT cost
- Donald Kleinschnitz of HP estimates that with today's management practices the number of storage managers required will exceed the population of California by 2004!
- Methods to reduce storage costs:
 - better resource management/utilization
 - interoperability/standards
 - use of lower cost storage devices such as ATA/IDE
 - reduction in power consumption (esp. HVAC costs)

Proportion of IT Spending



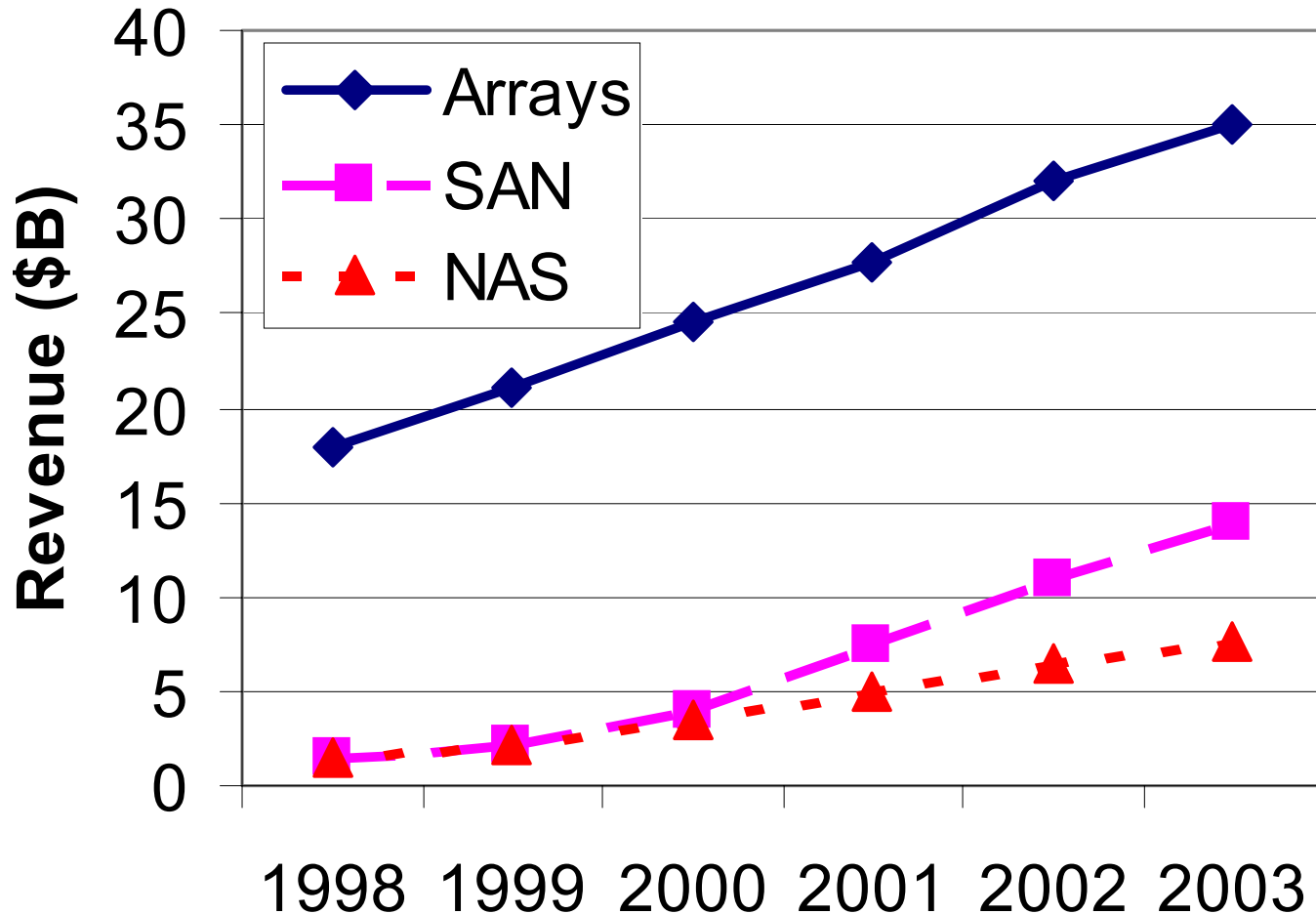
(Source: IDC)

Disk drive growth will be primarily in mobile storage, network storage and new applications. The traditional PC market seems to be near saturation.

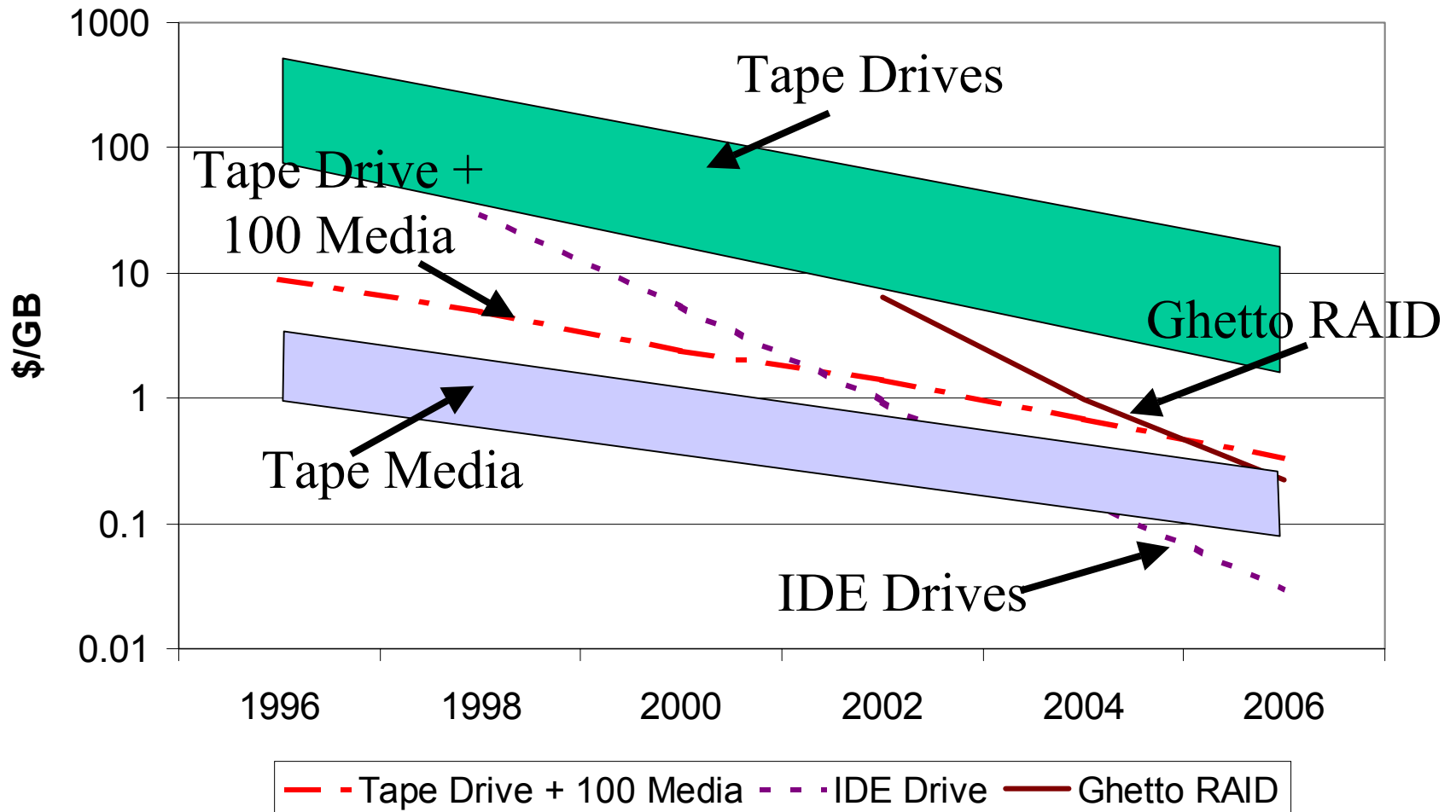


Disk drive arrays are expected to show strong revenue growth as are storage network systems such as SAN and NAS.

(Source: Peripheral Concepts, Inc. 2001)



As low cost disk drive storage decreases in price it will offer increasing competition to tape systems for back-up and other applications.

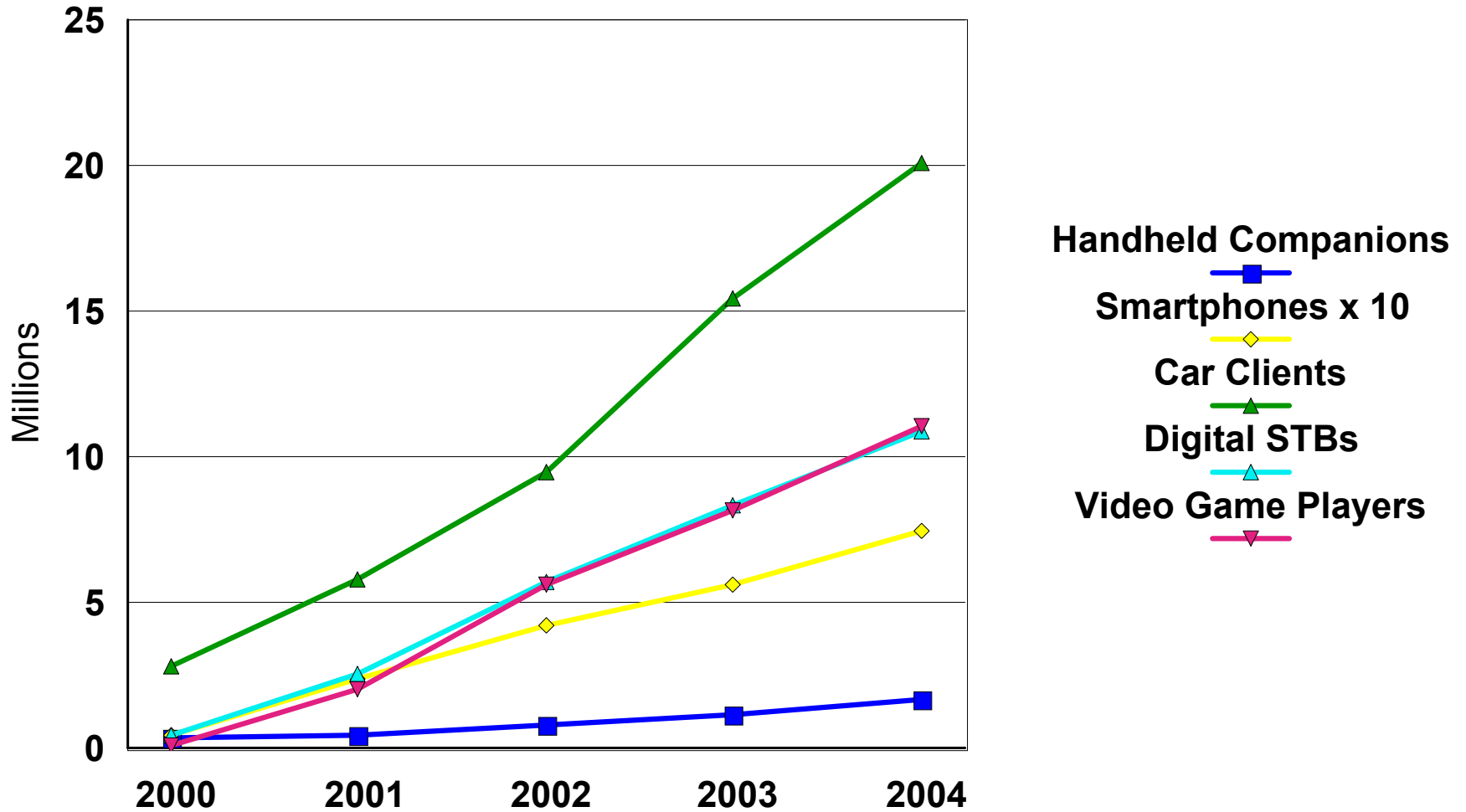


Optical Storage Projections

(Source: PRC 2001, units Millions)

	2000	2001	2002	2003
CD-ROM	82.9	56.4	30.2	18.6
DVD-ROM	30.1	60.3	92.8	107.3
CD/DVD RW	19.0	25.4	29.8	33.7
R/W < 4 GB	1.9	1.6	1.3	1.0
R/W > 4 GB		.2	.3	.8
TOTALS	133.9	143.9	154.4	161.4

GROWTH OF MOBILE INTERNET DEVICES TO 2004

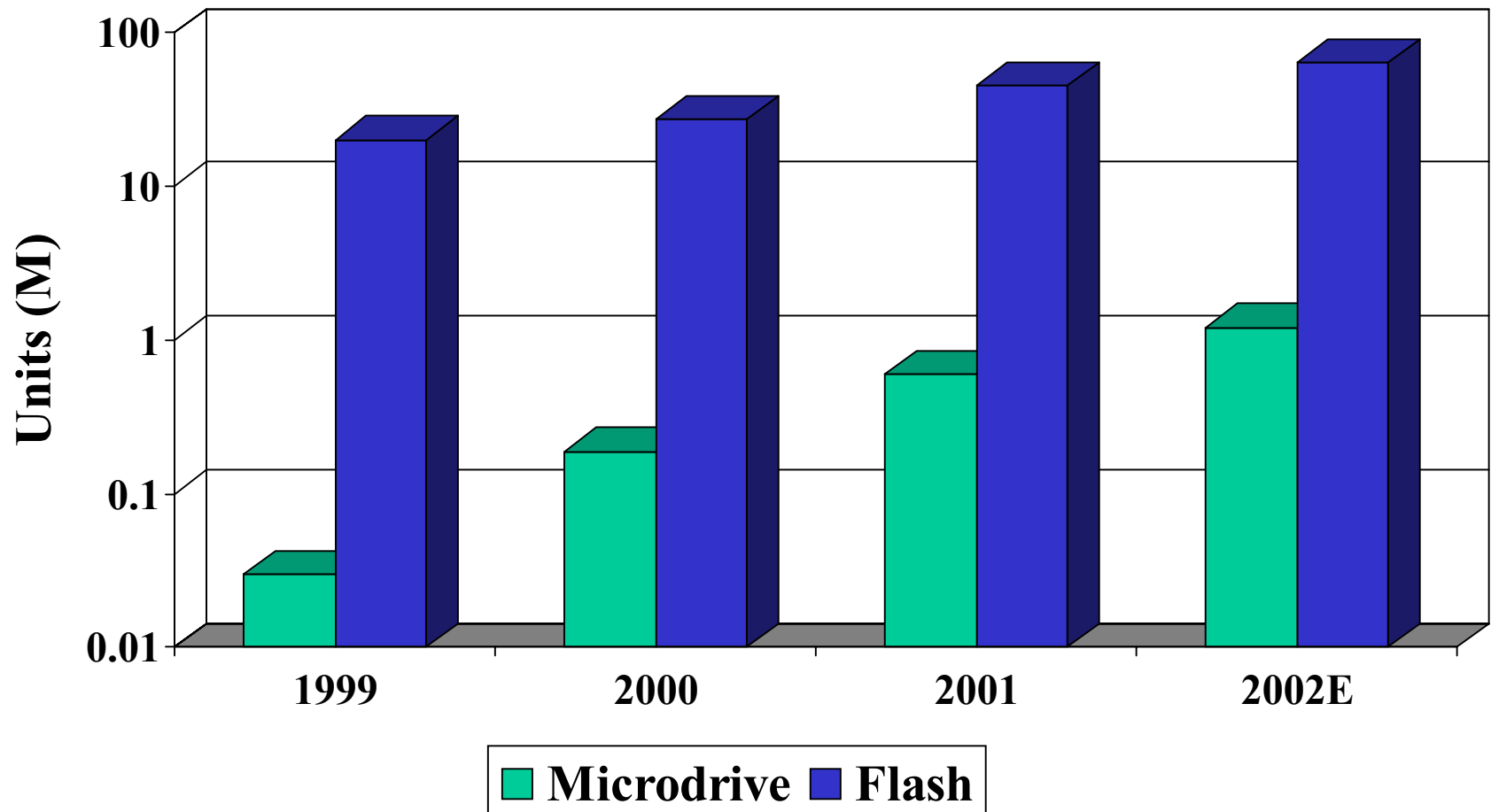


Source: IDC

Shipments of Mobile Storage Devices

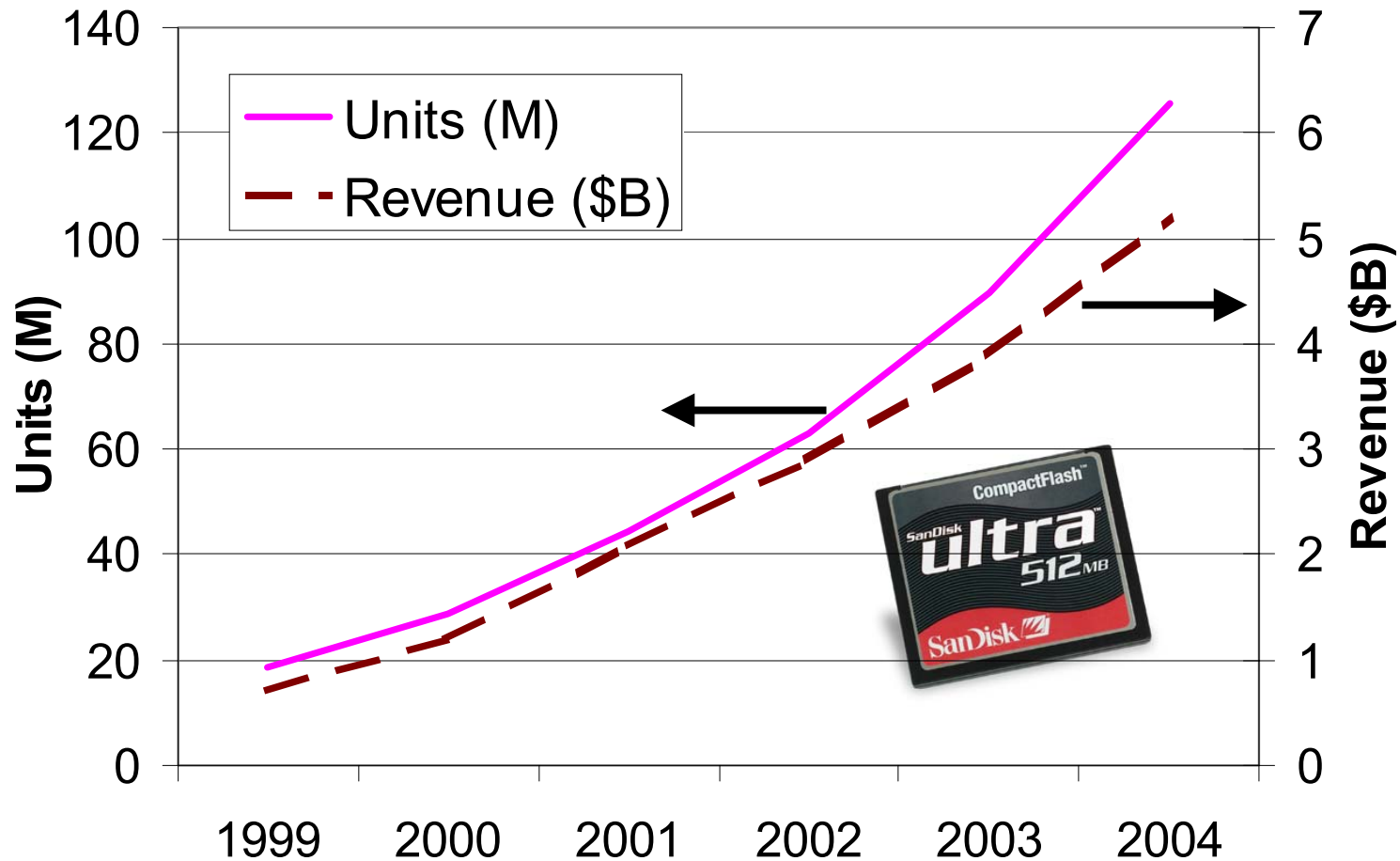
(note log scale)

Avg. Flash Price: <\$50, Microdrive Price (end of 2001): ~\$150

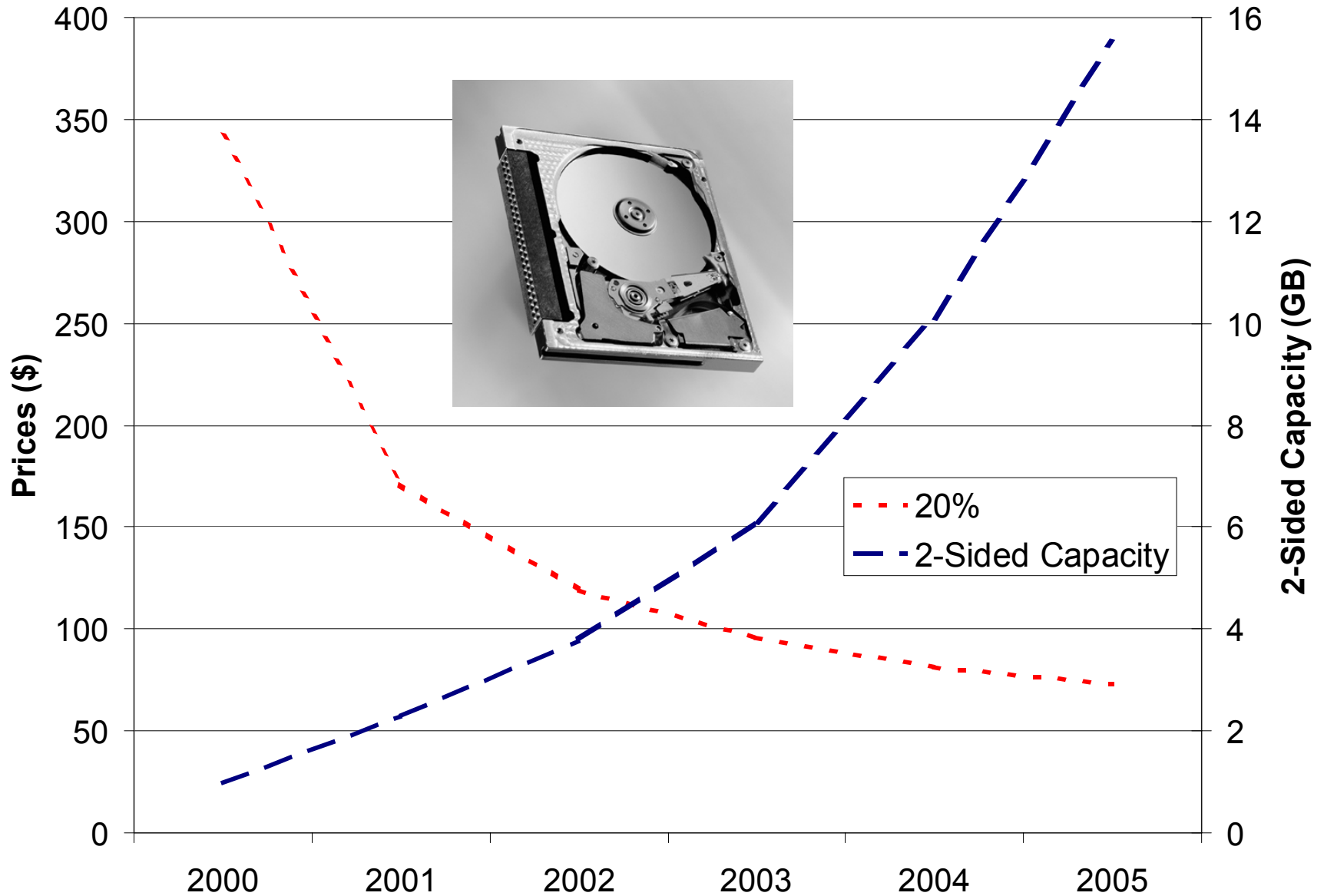


Compact flash memory is expected to show strong unit growth and be a significant source of revenue as mobile data storage applications grow.

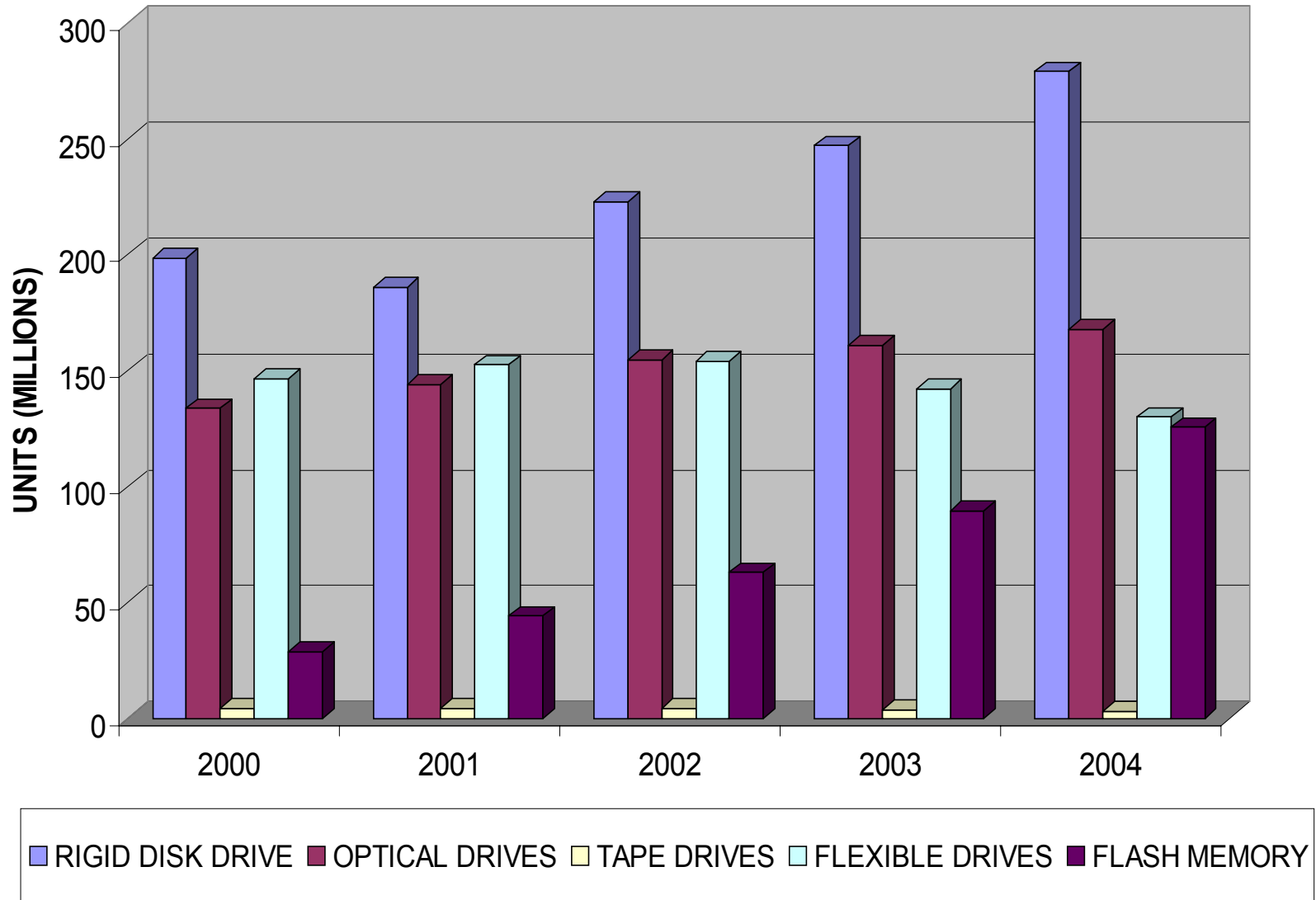
(IDC, 2000)



Microdrive Price and Capacity Projections



Flash and disk drives show strongest projected sales growth. Optical shows steady growth. Tape and floppy units are in decline.



Conclusions

- **Long-term growth opportunities for content data storage**
- **Needs for better storage management and cost effective storage**
- **Consumer electronics and mobile markets growing, unit forecasts should increase after 2001**
- **Drive based storage threatening tape in some applications**
- **Flash memory dominating small wireless and mobile devices except where very large capacity is needed**
- **Maybe opportunities for new content distribution devices such as DataPlay or IOMEGA products**

