



# Shake, Rattle and Roll: The HDD Industry's Next Phase

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The Premier Advanced Recording Technology Forum

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# **Shake, Rattle and Roll: The HDD Industry's Next Phase**

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**30th Anniversary THIC Meeting**

**March 9, 2004**

# Presentation Agenda



- SHAKE: The Excitement is Back
  - 2003 rollups for PCs, CE devices, and HDDs
- RATTLE: The Hurdles We Face
- ROLL: Growth Makes It All Better



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SHAKE:  
The Excitement is Back



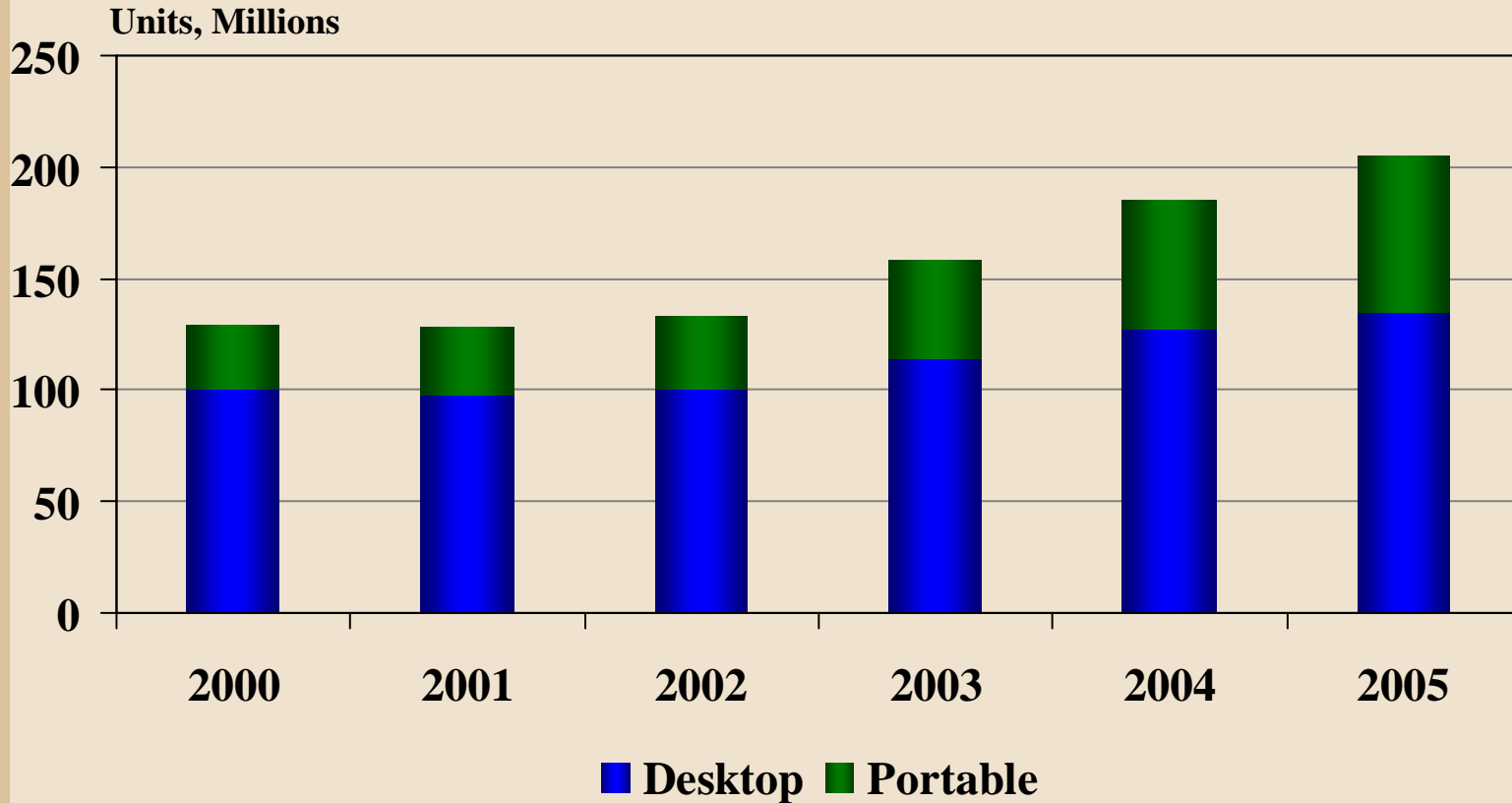
# PC Market Rebounded in 2003



- Initial '03 forecast: 143 million PCs
- Final '03 result: 158 million PCs
- Desktops 114 million, notebooks 44 million
- '04 forecast: 185 million!
- What happened?
  - Improved global economy
  - Fierce price wars – now \$299 desktops
  - Upgrade activity ongoing
  - Lower prices = new consumers

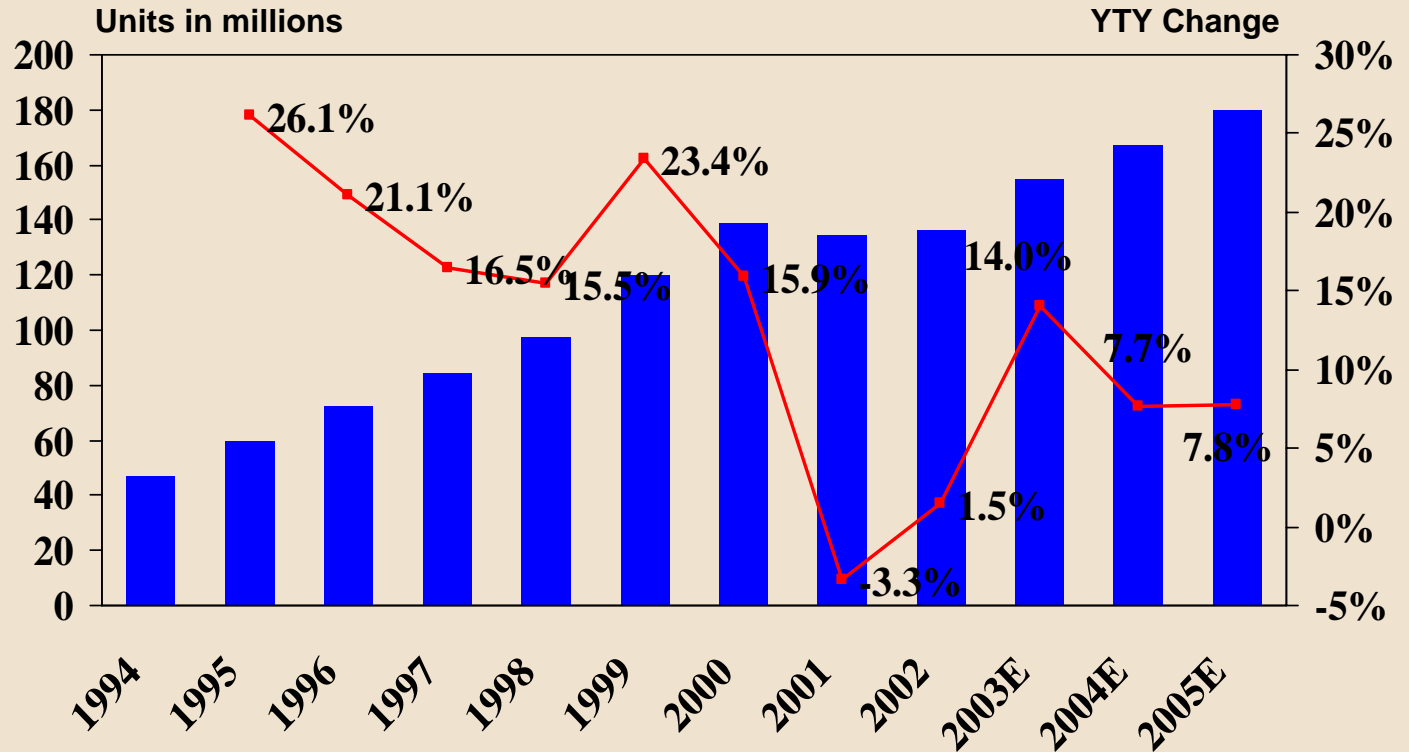


# Global PC Shipments





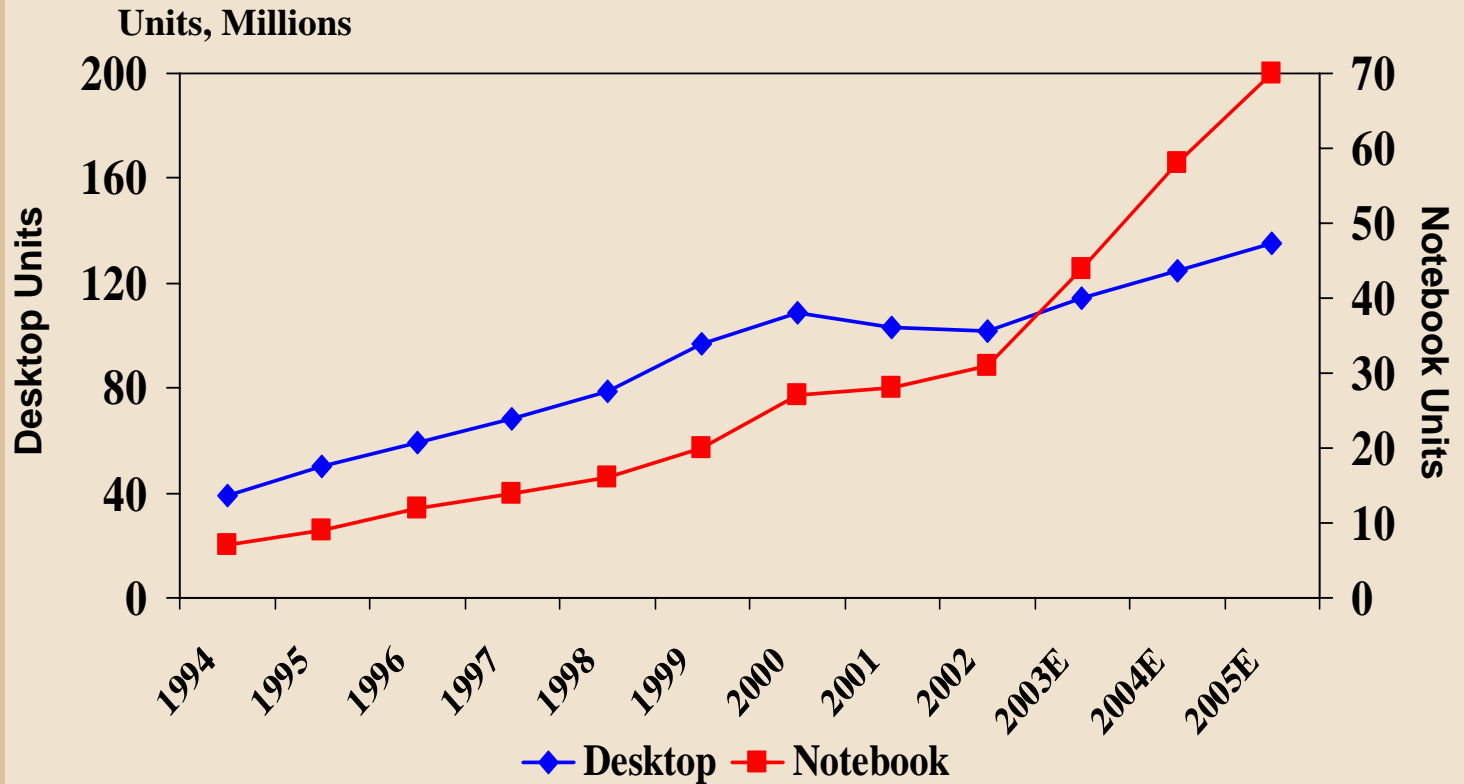
# Corporate Upgrade Cycle Starts





# Portable PCs Driving Growth

*•Desktop/notebook ratio has moved from 5:1 to nearly 3:1 within 8 quarters -- trend will continue*







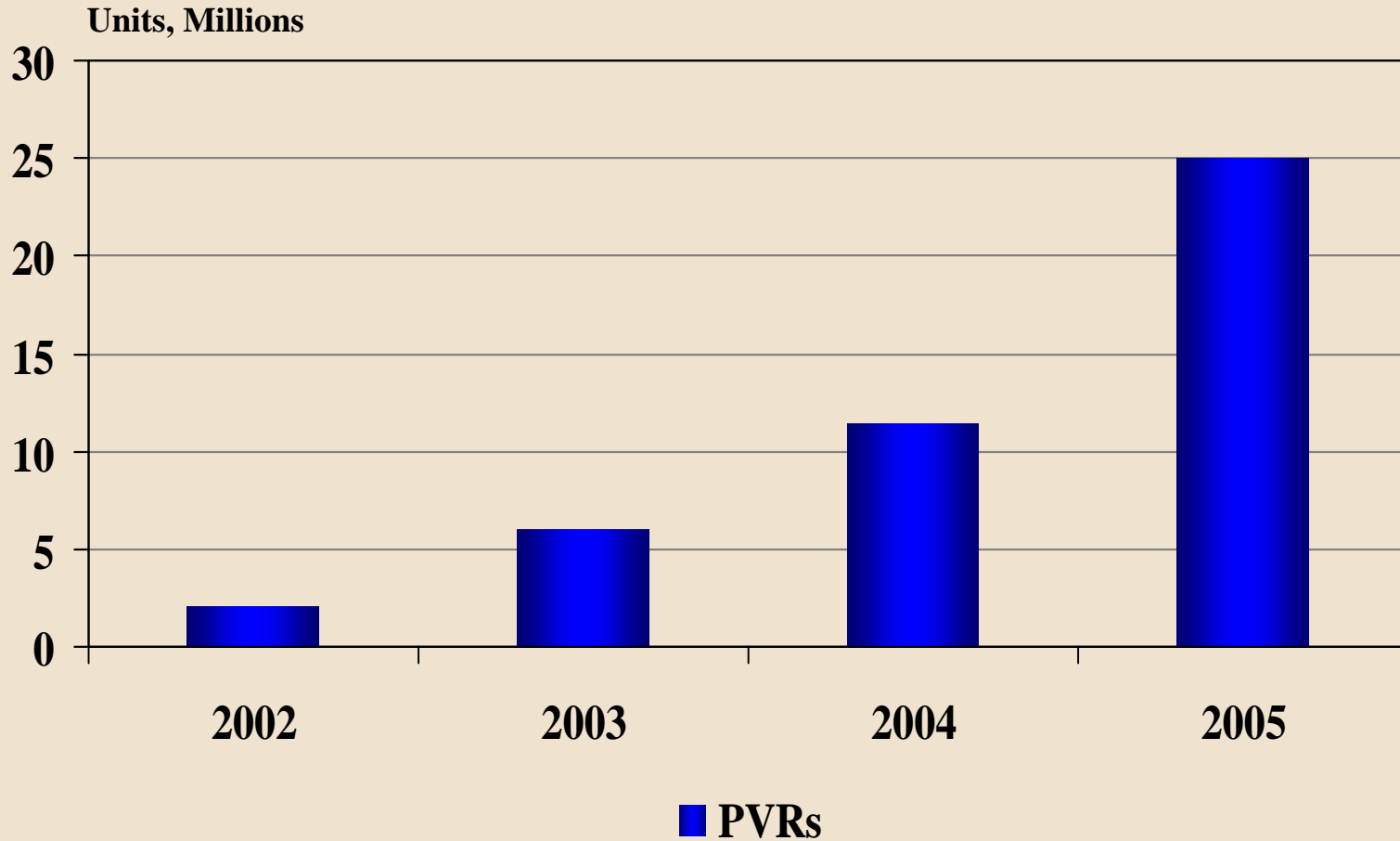
# CE Demand Is Ramping... Finally



- Initial '03 forecast: 14 million HDDs
- Final '03 result: 17 million HDDs
- '04 forecast: 29 million
- What changed:
  - Game consoles still largest volume, but
  - PVR market heated up for larger HDDs
  - MP3 demand soars – Thank you, iPod!
  - AIS, other markets were limited

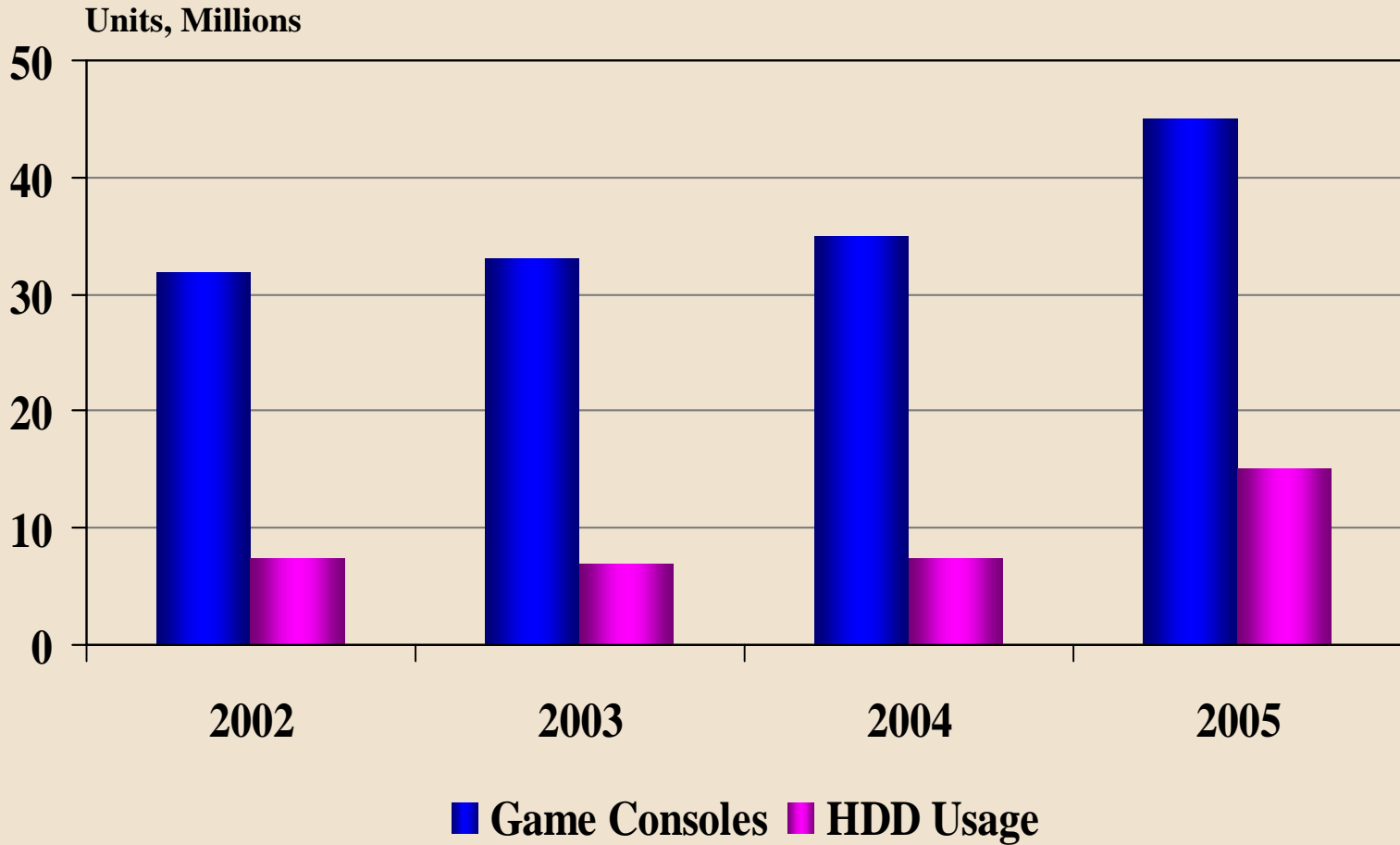
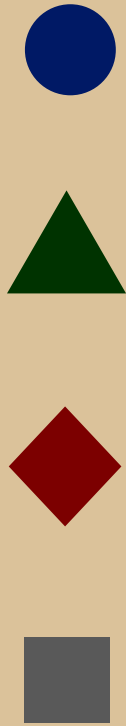


# PVR Beginning to Take Hold!



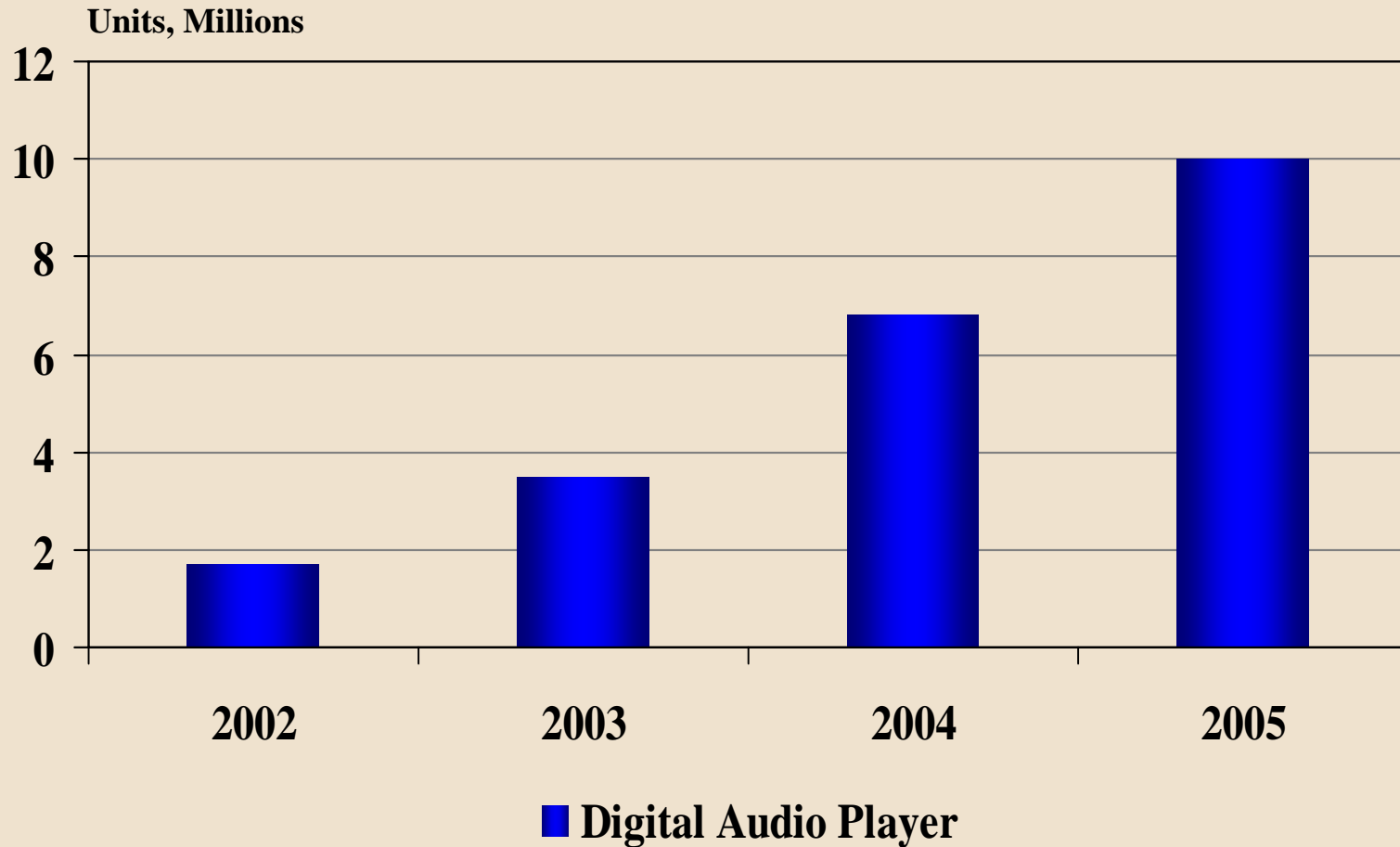
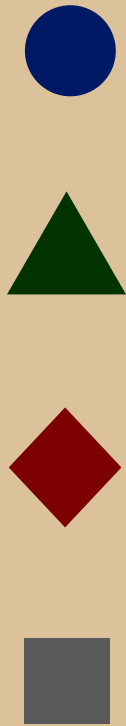


# Game Consoles: Xbox, PS2, PSX



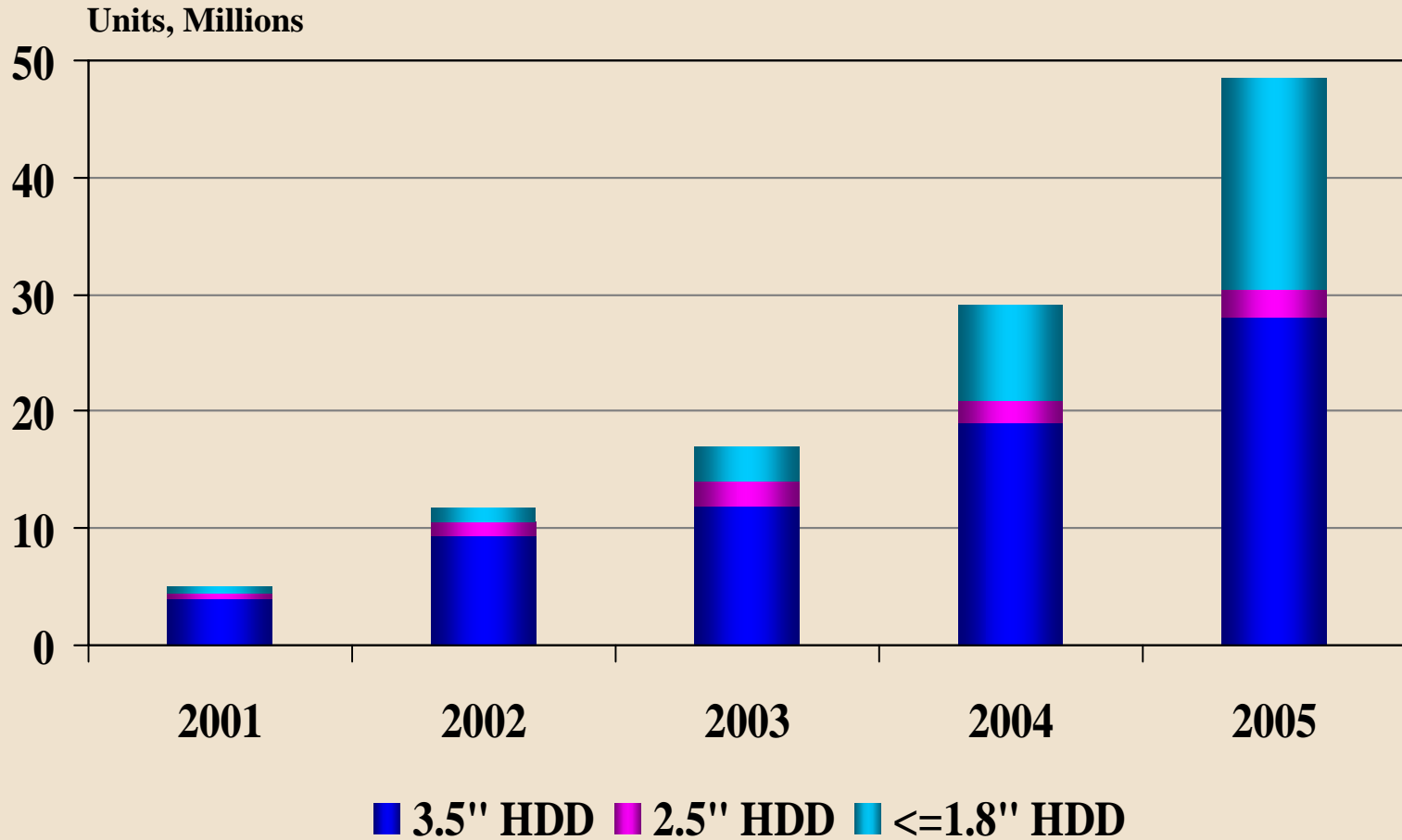


# Digital Audio: iPod Out in Front





# CE Opportunity–Storage Level





# Other CE Devices, Challenges



- Portable Media Center (2.5"/1.8")
  - Battery-operated A/V, music portables
- Digital cameras (1.8", 1")
- Auto intelligence systems (2.5", 1.8")
- Wireless will enable small HDDs
- Heat, reliability still issues
- Cell phones want 0.85" – but at what price? Many phones are giveaways!



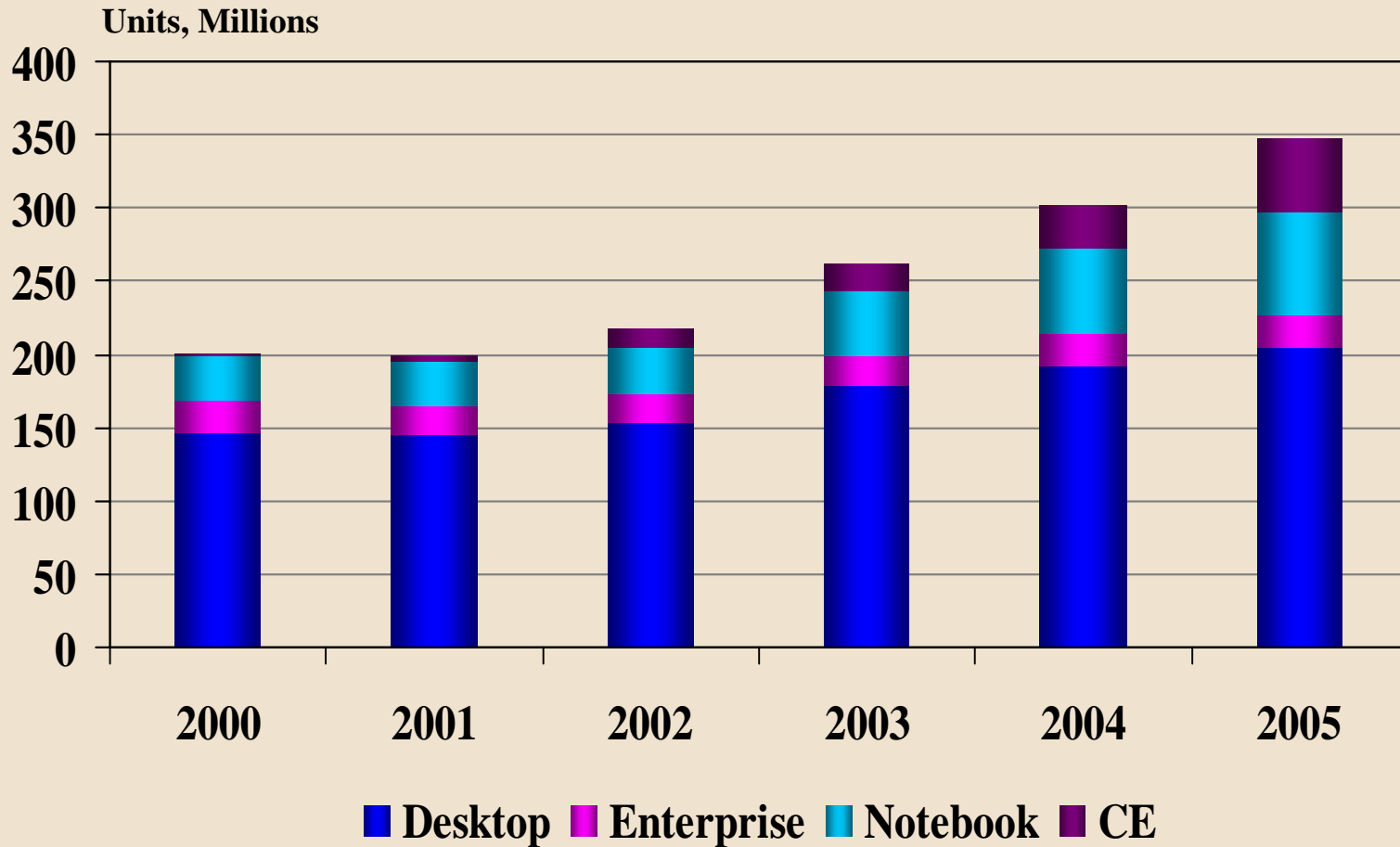
## 2003 HDD Shipments Surge



- Initial '03 forecast: 241 million HDDs
- Final '03 result: 261 million (16% YTY)
- '04 forecast: 301 million
- Desktop demand stays healthy
- Portable PC expansion continued at rapid rate, HDDs were on allocation
- High-end remains enigmatic
- CE improvements in all segments – the engine for growth and excitement!



# HDD Shipments by Segment







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**RATTLE:**  
The Hurdles We Still Face

# Positives, Risks in Desktop HDDs

- Desktop is profitable again
- PC component with pricing power
  - Until CQ4 '03, price declines were moderate
- 80GB/platter transition was tough
  - Longer product cycles = better returns?
- Sweet spot at 40GB (~50% CQ4 units)
  - 80 GB won't be leading capacity until mid-2004
- CQ3 “borrowed” from CQ4
  - CQ3 = 21% sequential, 30% annual growth
  - CQ4 = 9% sequential, 25% annual growth

## 2.5" HDD Overcapacity?

- Supply/demand favors HDD companies today... but '04 plans for ALL HDD suppliers exceeds demand outlooks
- Seagate gaining, Samsung entered
- WDC, MXO coming – How about Matsushita?
- If expansion plans, new entry schedules don't change, overcapacity will occur



# Changes Coming in Interfaces



- Serial-ATA (SATA)
  - Will become standard on desktop in '05
  - Notebook transition to take off in '06
  - Adoption in enterprise, but lack of dual-port will limit addressable market
- Serial-Attached SCSI (SAS)
  - Saves SCSI, ramp seen late in '04
  - Key: share same physical layer at SATA, plug-compatible with SATA
  - First deployed on 2.5" enterprise, 15krpm in '06
  - Dual-port likely in '05; threat to fibre-channel?



# Future GB/Disk Transitions?

- 100 GB/disk?
- 120 GB/disk?
- 125 GB/disk?
- 160 GB/disk?
- In 2007, capacities could be
  - 500-600 GB/disk for 95mm desktop
  - 150 GB/disk for 65mm enterprise
  - 250-300 GB/disk for 65mm portable
  - 80-100 GB/disk for 48mm portable
  - 25-30 GB/disk for 1"
  - 10-20 GB/disk for <1"?





# Infrastructure Readiness

- Believe it or not.....
  - Media capacity is tight
  - Head capacity is tight
  - Perpendicular recording is coming, and who will be ready?





# HDD Suppliers: Any Rattles?



- Fujitsu: great comeback in '03
- Maxtor: Hitting stride
- HGST: Now the fun begins
- Samsung: Steady progress
- Seagate: All the tools (despite CQ4 issues)
- Toshiba: Notebook/CE power
- WD: SATA, portable HDD targets
- Cornice: Newcomer off to fast start
- GS Magicstor: Early promise
- Excelstor: Focused desktop supplier in Asia

# Overproduction Again!?!?

- Consolidation didn't prevent late year overproduction (again)
- CQ4 '03 price erosion was double the normal rate on desktop
- Key now is how it is handled in 1H '04
- HDD industry damaging hard-earned investor respect
- Historic opportunity





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ROLL:  
Growth Makes It All Better

# Demand Outlook Outstanding



- Desktop PCs to grow 11% in 2004
- Portable PC shipments seen up 29%
- Core demand strong, solid in 2004, but
  - Are price wars back to stay?
  - Watch 2.5" supply/demand balance
- CE becoming a meaningful segment
  - Near 10% in '04, 20% in '07



# Conclusions, HDDs



- HDD companies enjoyed record '03
  - But why aggressive pricing in PC HDDs?
  - Oversupply likely unless HDD suppliers quickly adjust thinking
- Core demand strong, solid in 2004, but
  - Are price wars back to stay?
  - Watch 2.5" supply/demand balance
- **TREMENDOUS SFF opportunities -- assuming a longer-term horizon**

# Any Challengers to HDD?



- NO, but in the next 5-10 years...
  - OPTICAL: varying formats, speeds not a threat despite huge market in consumer, PC applications for recording, archiving
  - FLASH: competitive with 1" HDD in some applications, but cost premiums to remain huge
  - OTHERS: MEMS? Not much chance!
  - Watch for perpendicular recording ('04/05?), heat-assisted magnetic recording (HAMR, 2005/6), millipede-type technologies (2007/8)
- HDDs to dominate storage for years to come!

# Conclusions, Key Points for 2004



- PC market growth to remain healthy
- Consumer HDD demand growing
- Overproduction, overcapacity, price war
- Growth masks our ills
- Technology difficulty with either
  - Slow areal density growth and extend HDD cycles, or
  - Compel a technology leader to shift faster to perpendicular

The image features a central graphic on a light beige background. A horizontal band of a darker beige color runs across the middle. On the left side, several curved lines in white, blue, red, and green sweep upwards and to the right. In the center, a black horizontal bar is positioned above a white rectangular box. The white box contains the word 'TREND' in black, uppercase, sans-serif font. To the right of the white box, the black bar continues, containing the word 'FOCUS' in white, uppercase, sans-serif font.

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