



STORAGE 2.1 BILLION  
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DATA PHOTOS  
EMAIL PHOTOS 2.1 B  
STORAGE INTERNET B  
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CLOUD INS

# Jeff Burke

VICE PRESIDENT, STRATEGIC MARKETING  
& RESEARCH



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# THE CASE FOR SOLID STATE DISK

THE CASE FOR SOLID STATE DISK

~~MASS STORAGE~~

# Flash Summit 2007 – Seagate Said the Following About SSDs

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# Flash Summit 2007 – Seagate Said the Following About SSDs

**Not question of “if”**

**But a question of when,  
where & why?**

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# Flash Summit 2007 – Seagate Said the Following About SSDs

**A mass market is likely  
at least five years away**

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# So What was Our Opinion Based On?

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So What was Our Opinion Based On?

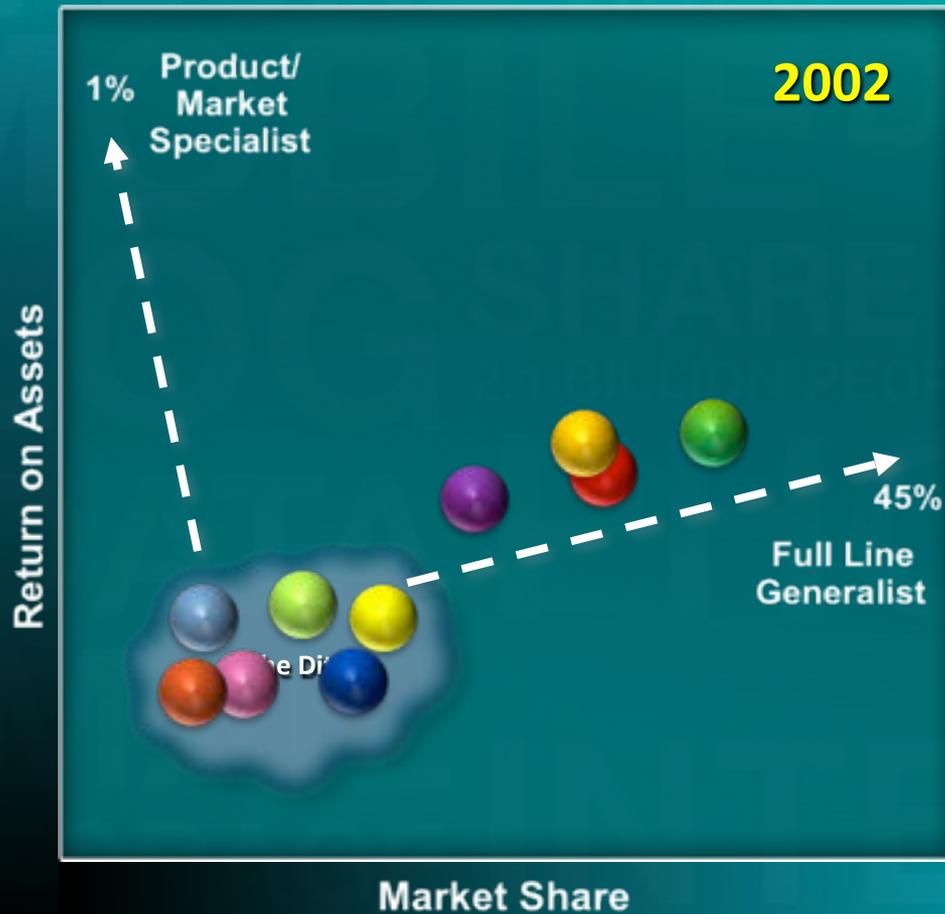
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# Economics

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Thursday, August 23, 12

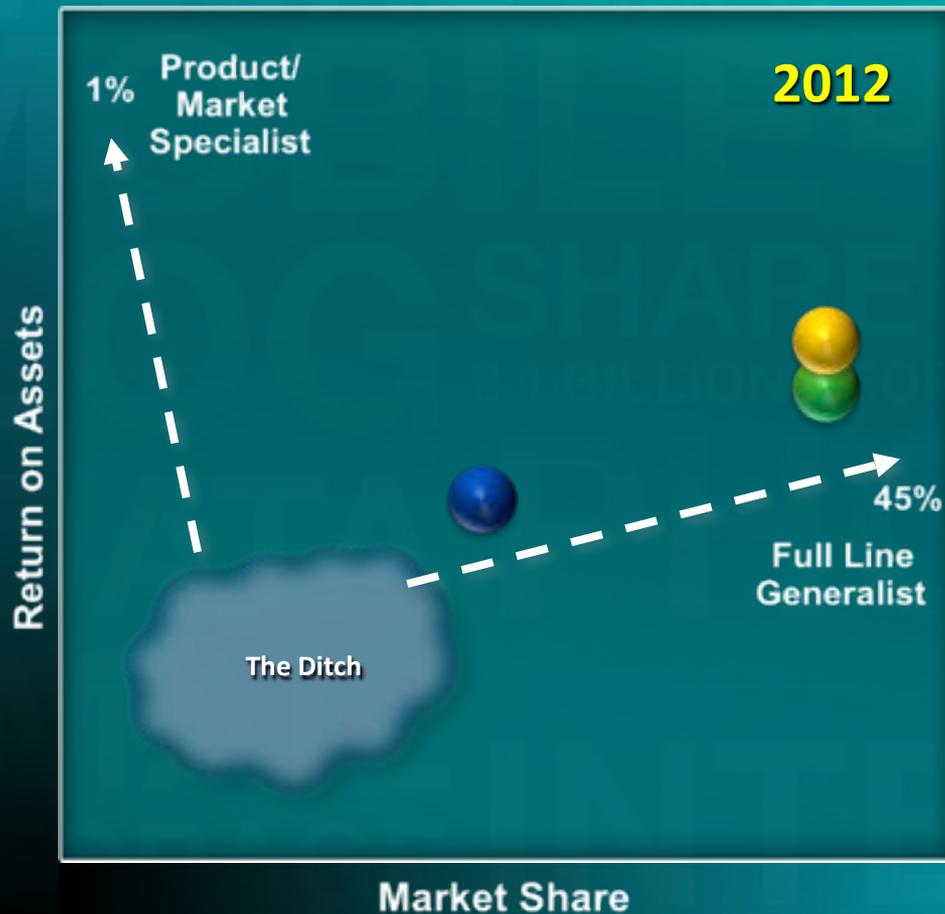
# A Couple of Lessons from the HDD Business – Consolidation



Source: Seagate Market & Competitive Intelligence: Shah & Sood, 2002

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# A Couple of Lessons from the HDD Business – Consolidation



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**A commodity industry will tend towards three players**

**It took twenty years in the HDD business**

**It will occur more rapidly in the SSD market**

STORAGE

MARKET

# A Couple of Lessons from the HDD Business – Customers are Always Driving to Get More for Less

Revenue in Billions      Units in Millions, Capacity in Exabytes



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Source: Seagate Market & Competitive Intelligence

# A Couple of Lessons from the HDD Business – Customers are Always Driving to Get More for Less

## The Case of the Enterprise HDD Market

Revenue in Billions      Units in Millions, Capacity in Exabytes



- The enterprise HDD business has seen essentially flat revenue over the last decade
- Yet the customer received tremendous value for their investment
  - 2x the number of units were shipped
  - Exabytes demand increase 100x

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Source: Seagate Market & Competitive Intelligence

# In Response to the Demand for Data - But it Does Go Beyond Just Data



*Seagate Confidential*

*Source: Symantec Survey commissioned by ReRez Research 2012*

# In Response to the Demand for Data - But it Does Go Beyond Just Data

## Data Is:

- Artificial because it is created by machines
- Data in of itself is meaningless & not worth saving
- But it is the basis for information & knowledge



# In Response to the Demand for Data - But it Does Go Beyond Just Data

## Data Is:

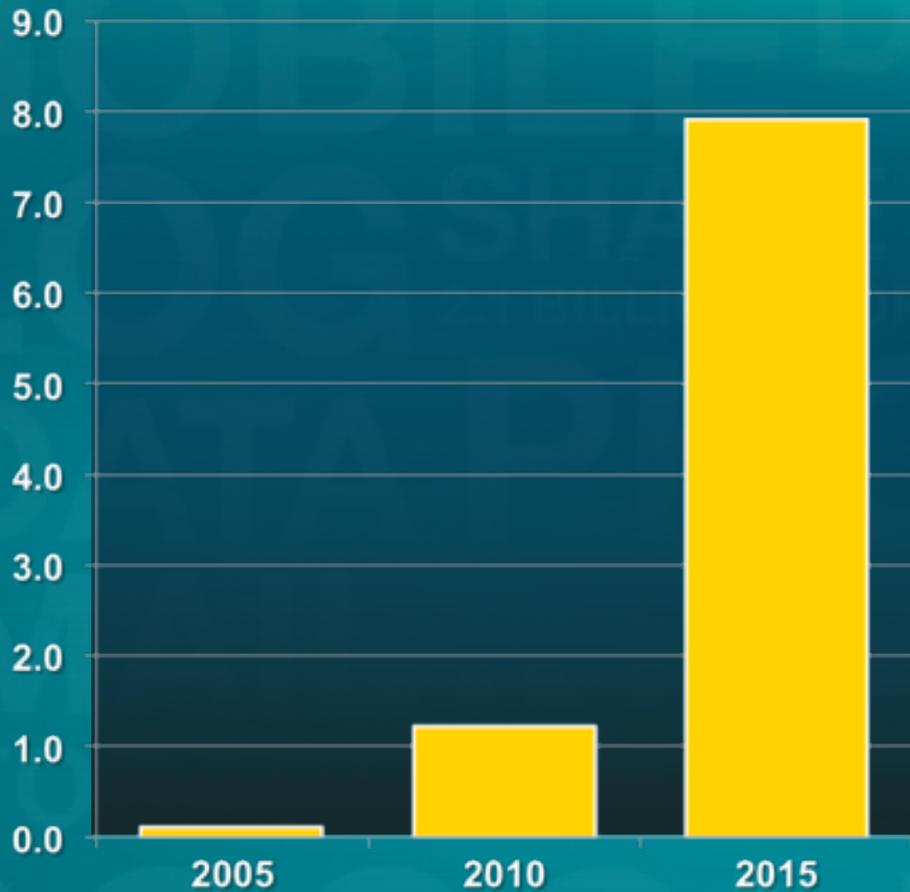
- Artificial because it is created by machines
- Data in of itself is meaningless & not worth saving
- But it is the basis for information & knowledge



**Digital information makes up 49%  
of an organization's total value\***

# So How Much Data / Information is Out There?

*Zettabytes of Data Created & Replicated*

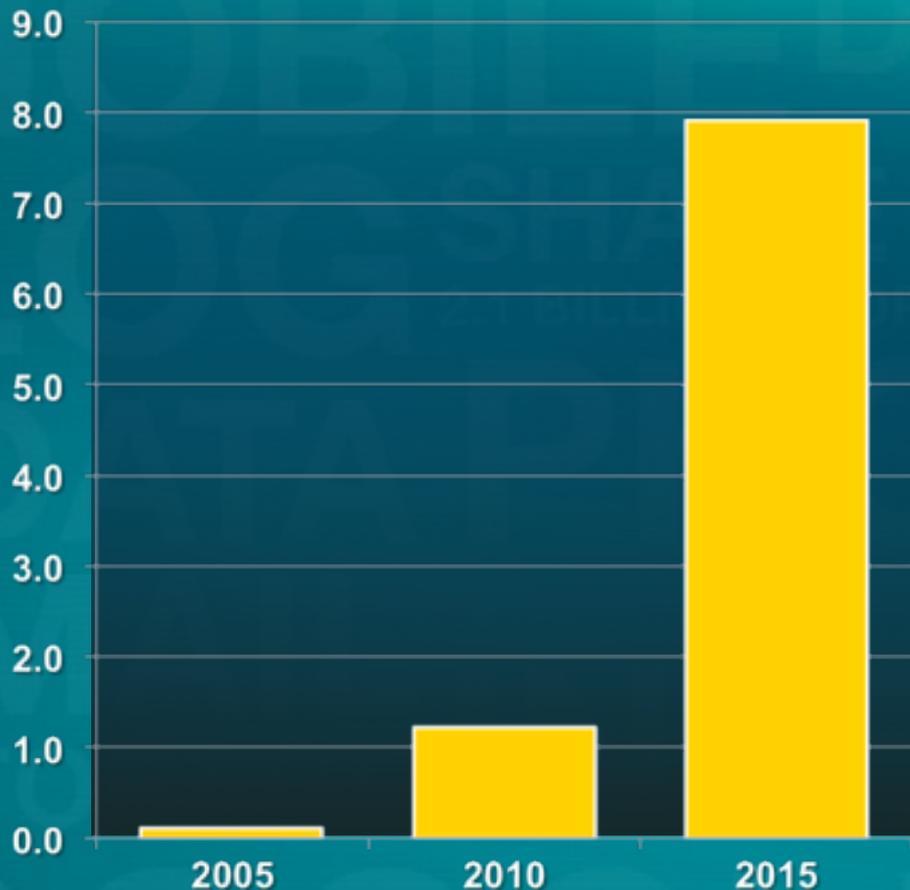


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*Source: IDC's Digital Universe Study, sponsored by EMC June 2011*

# So How Much Data / Information is Out There?

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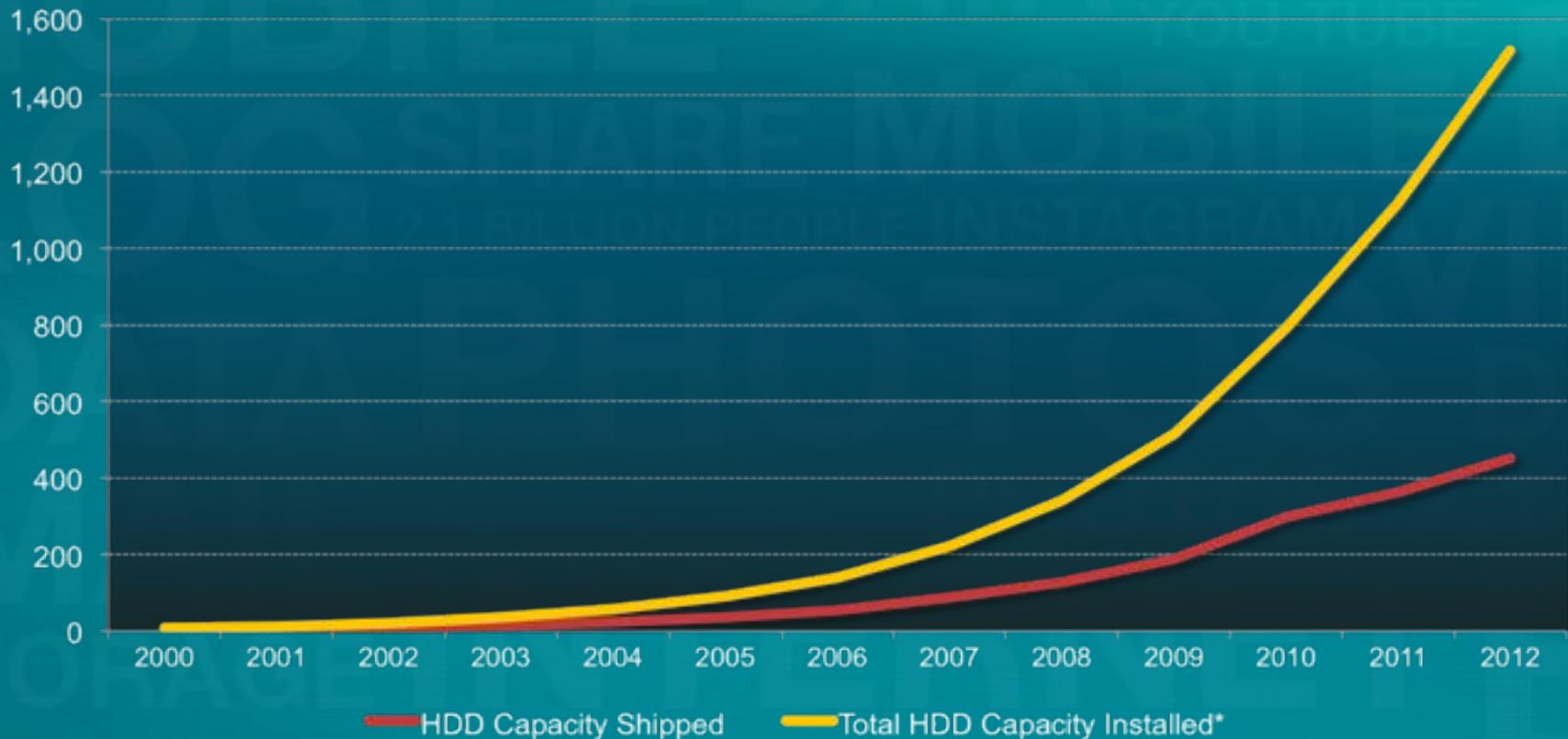
- Data creation doubles every two years
- One gigabyte of stored data creates a petabyte of transient data
- The Symantec study suggests businesses are storing 2.2 Zettabytes

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*Source: IDC's Digital Universe Study, sponsored by EMC June 2011*

# Interesting But ... We Are Worried About What is Digitally Stored

Exabytes of HDD Capacity



\* Assume a six year useful life for a hard disc drive

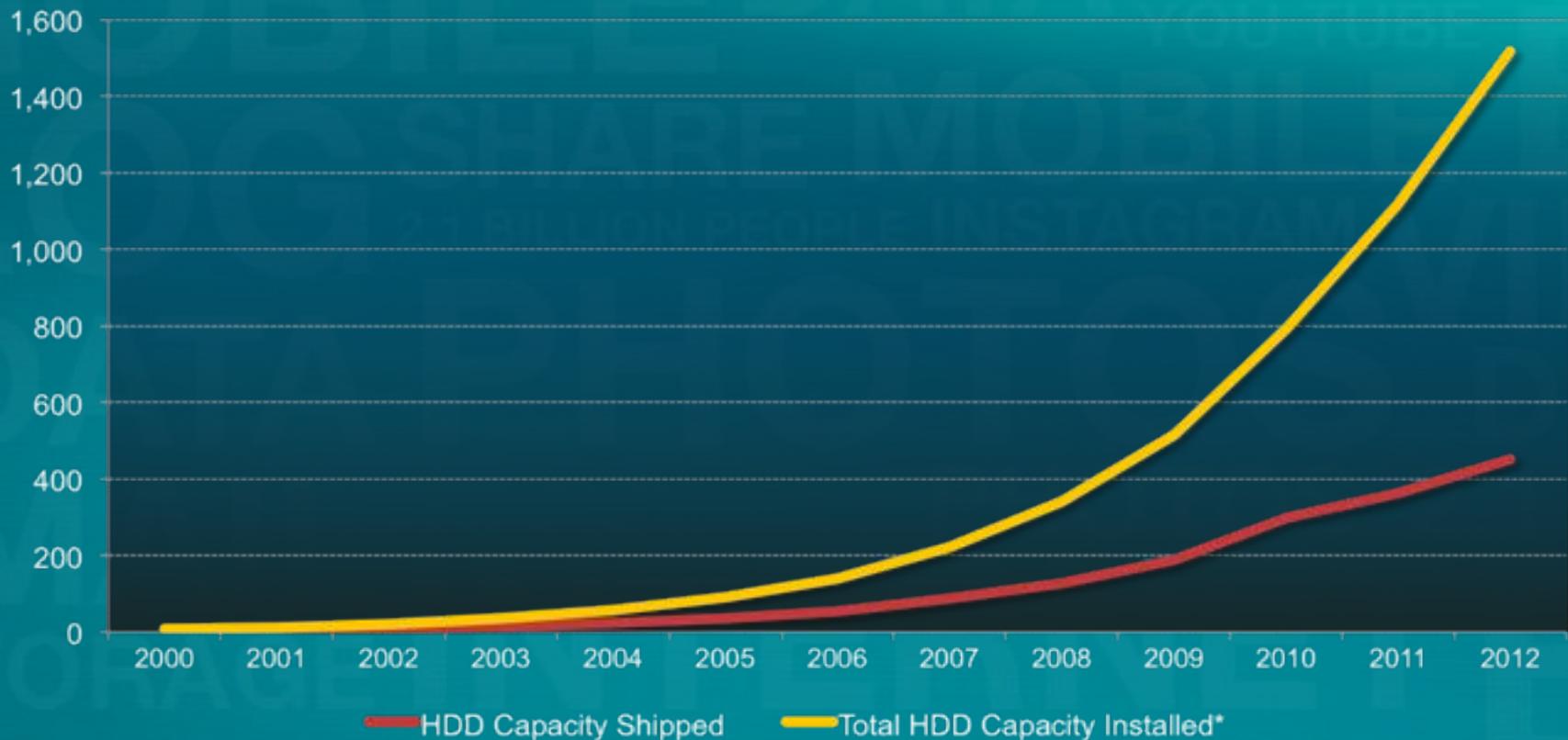
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Source: Seagate Market & Competitive Intelligence

# Interesting But ... We Are Worried About What is Digitally Stored

**The installed base is growing at a 57% CAGR**

*Exabytes of HDD Capacity*



\* Assume a six year useful life for a hard disc drive

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Source: Seagate Market & Competitive Intelligence

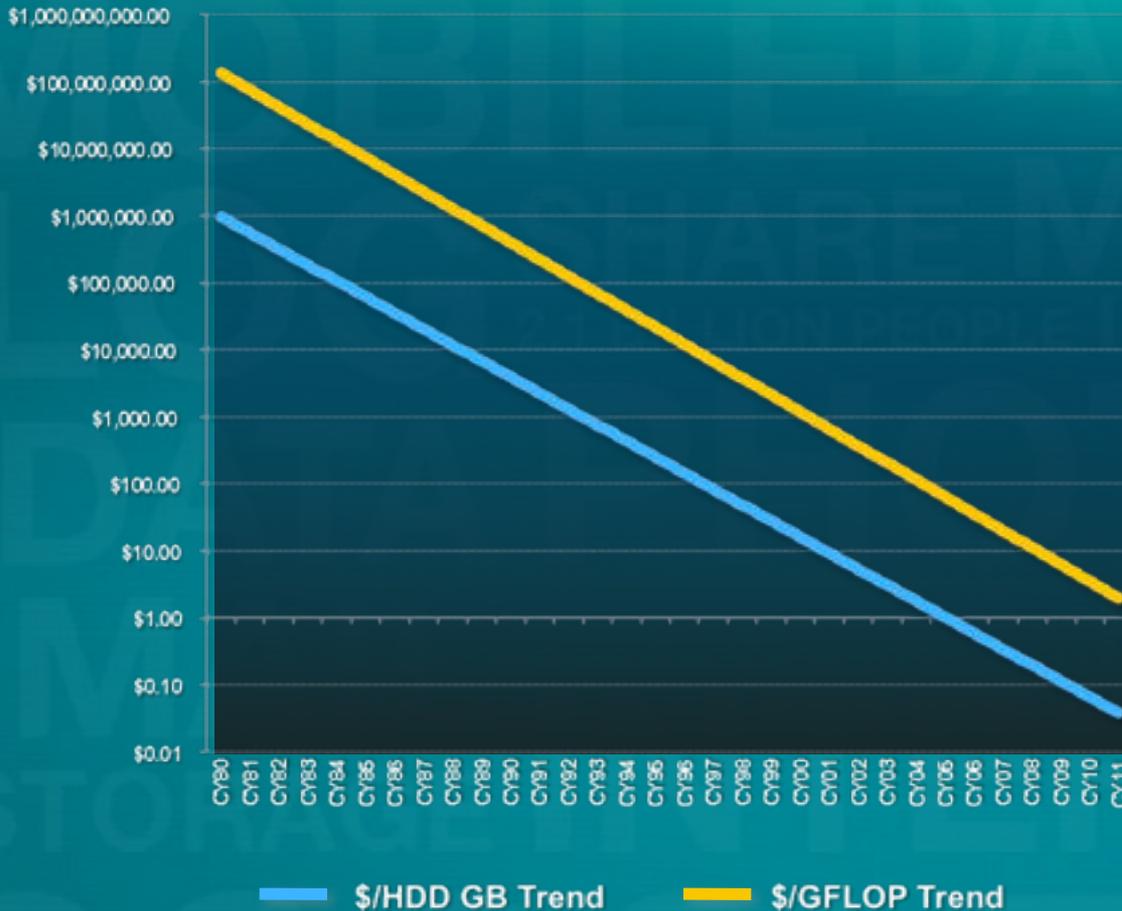
# The Relentless Improvement of Compute & Storage Capability are Creating Valuable Industries

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Source: Seagate Market & Competitive Intelligence

# The Relentless Improvement of Compute & Storage Capability are Creating Valuable Industries

Cost in US Dollars



YouTube



Gmail  
by Google

Spotify



NETFLIX

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Source: Seagate Market & Competitive Intelligence

# And Will Continue to do So



*Seagate Confidential*

Source: Science—On the Future of Genomic Data—Kahn, 2011

Thursday, August 23, 12

And Will Continue to do So

## An Extreme Data Growth Example – Genome Sequencing

Output from the latest  
generation genome  
sequencing machines  
has grown from 10MB  
to 40GB per day

# It is Real Demand for Storage

*Measured as Yr on Yr Growth of Average Capacity per Drive*

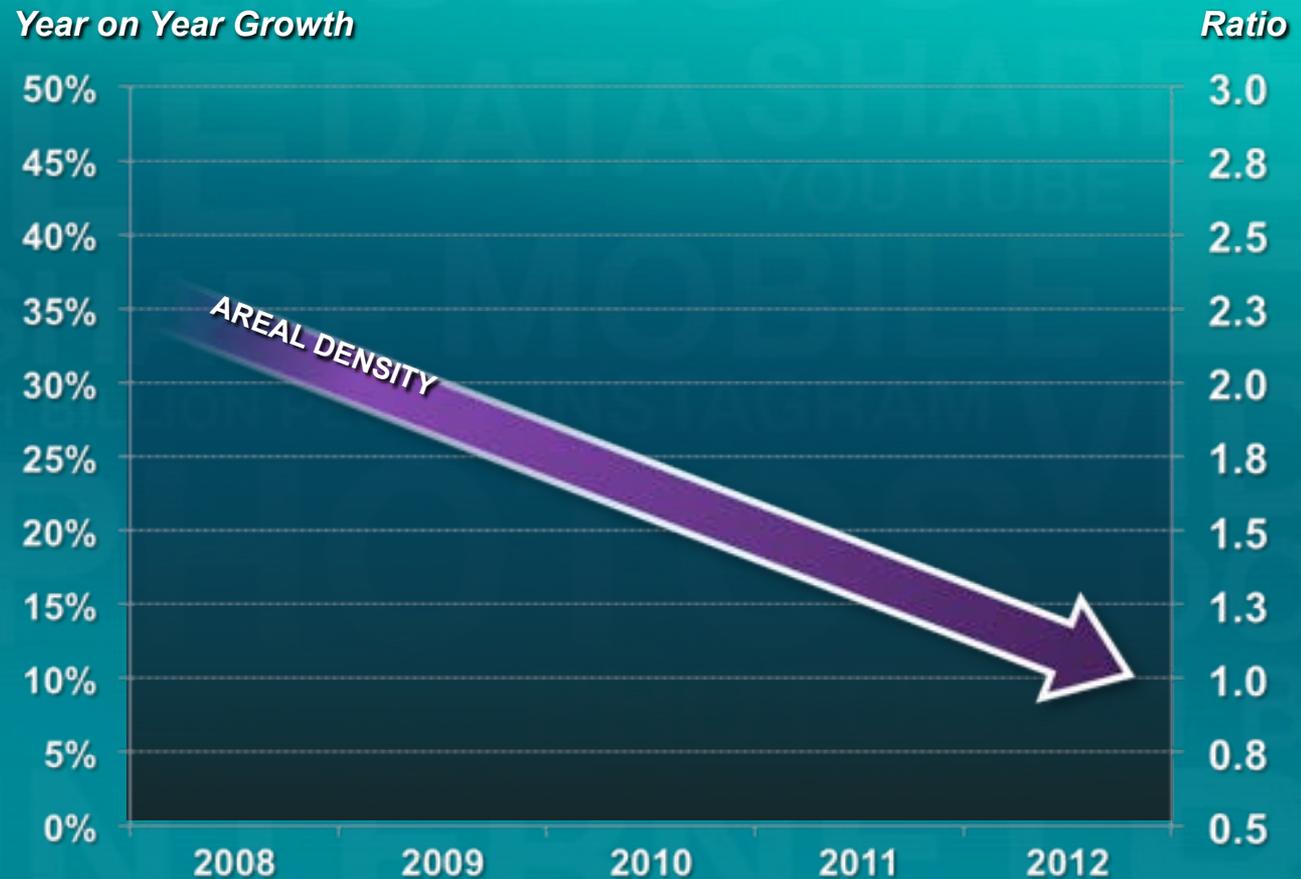


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Source: Seagate Market & Competitive Intelligence

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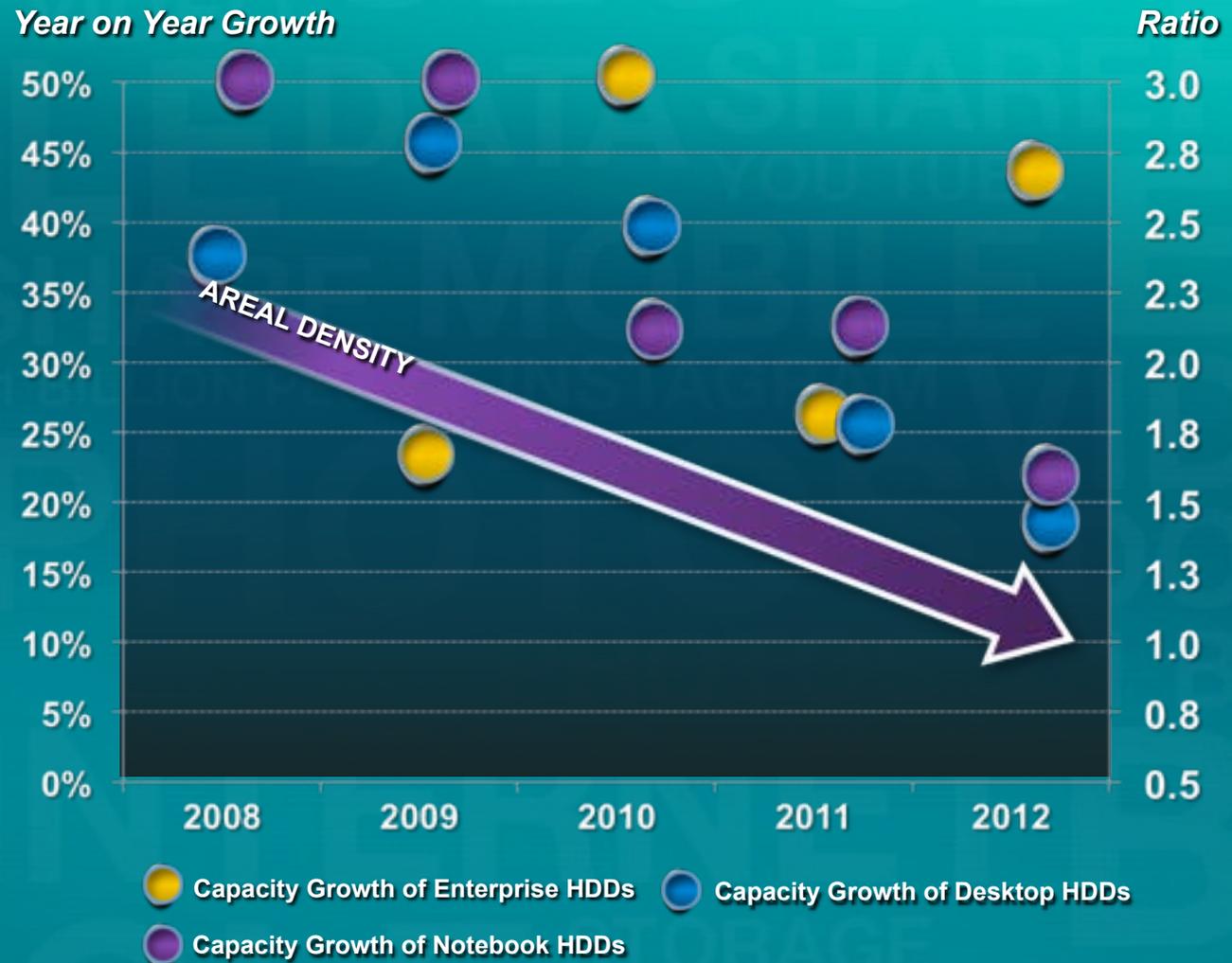


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Source: Seagate Market & Competitive Intelligence

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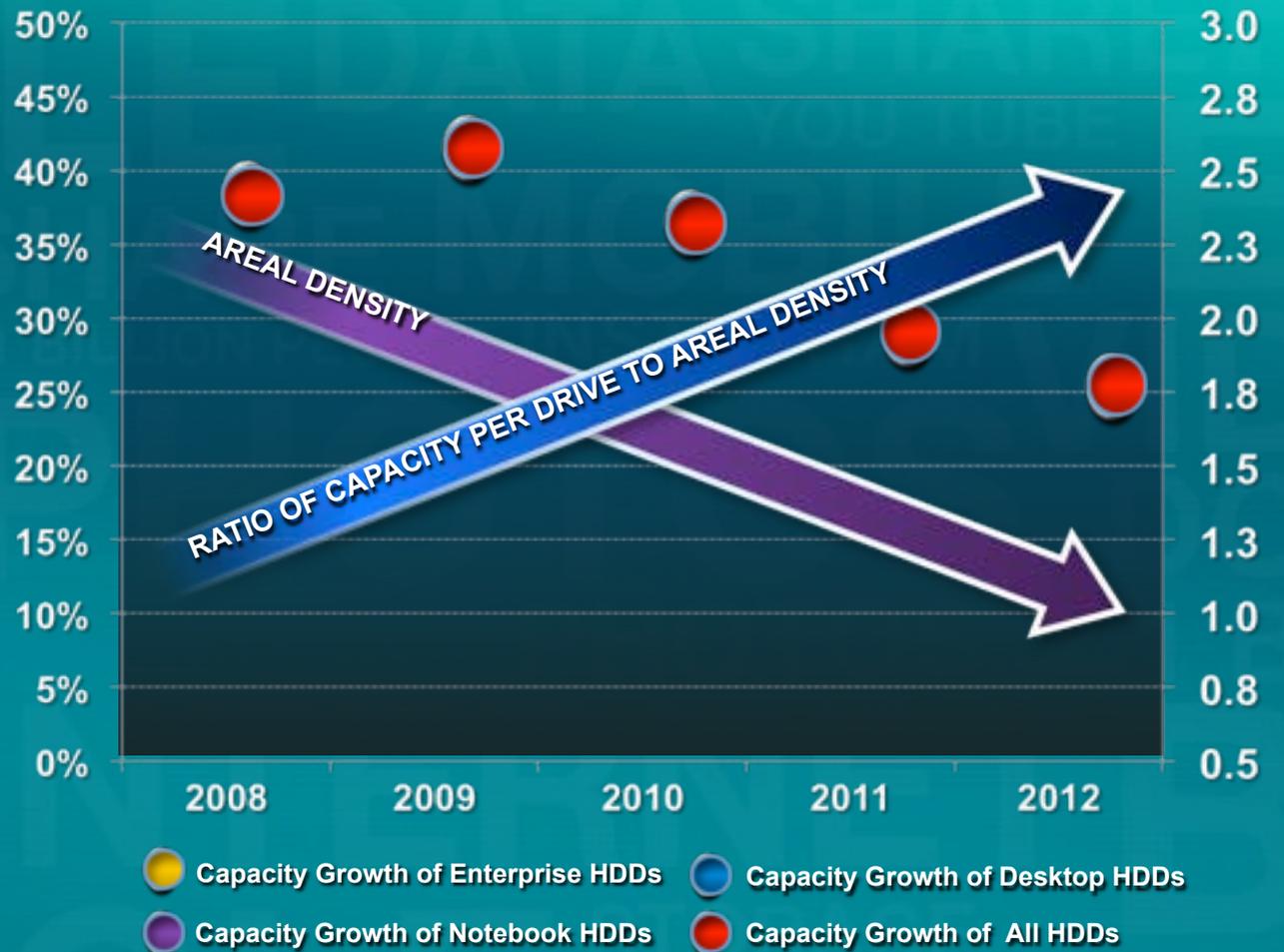
Measured as Yr on Yr Growth of Average Capacity per Drive

Capacity of HDDs are growing 2x faster than the technology



Year on Year Growth

Ratio

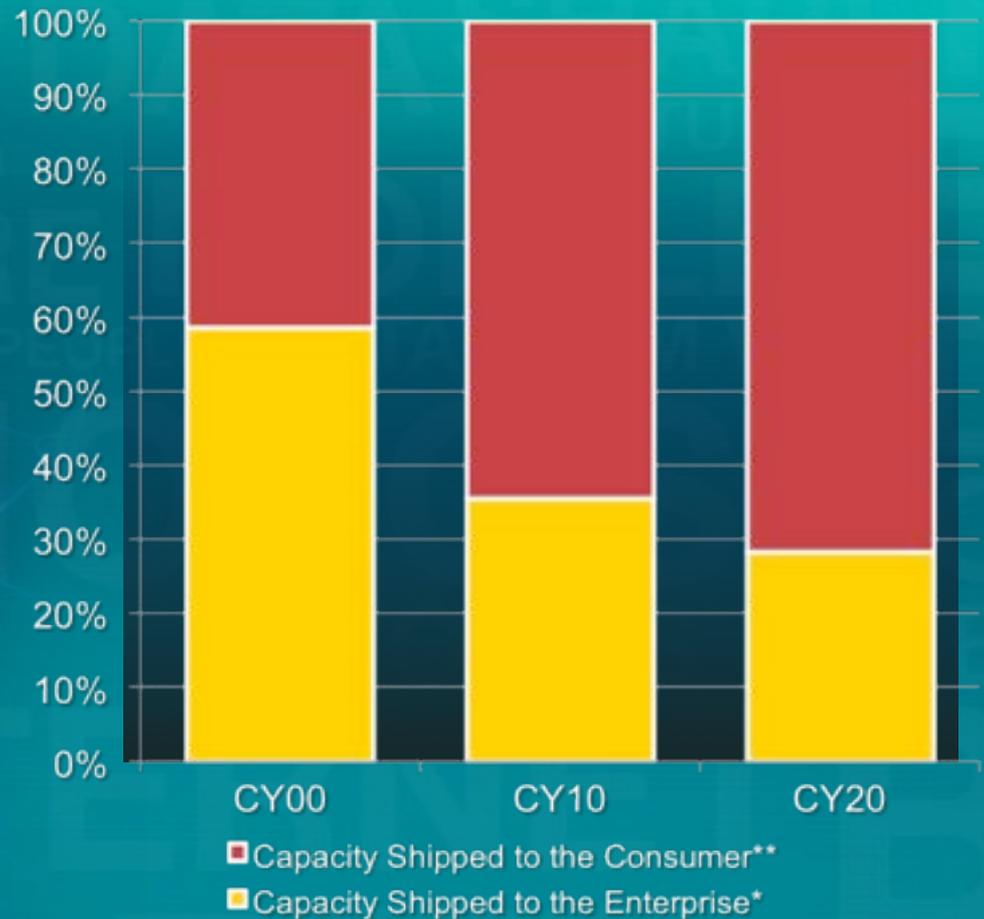


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Source: Seagate Market & Competitive Intelligence

# Remember – Where the Data is Located is Important & Changing

*Percent of Market*



*\* All capacity shipped to Business / Mission Critical, Commercial Notebook & Desktop applications*

*\*\* All capacity shipped to Consumer Notebook & Desktop, Consumer Electronics & Personal Cloud (Retail)*

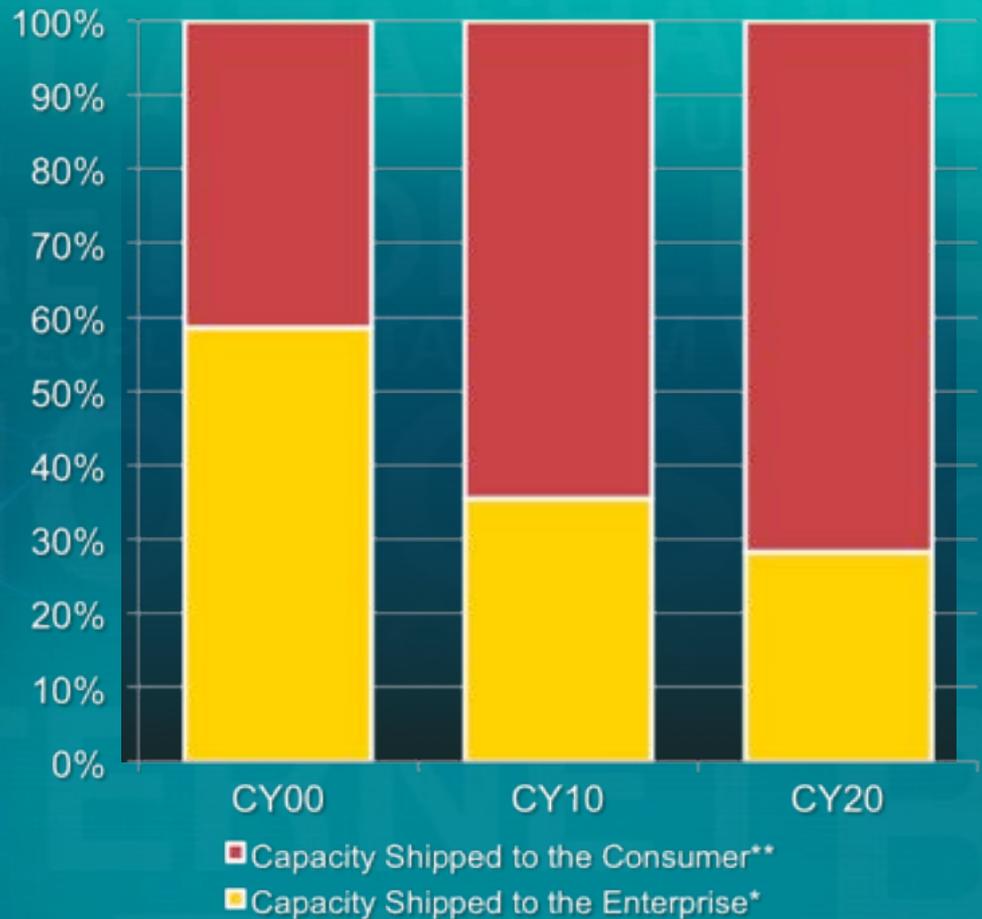
*Source: Seagate Market & Competitive Intelligence*

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# Remember – Where the Data is Located is Important & Changing

Consumers will continue to drive data creation and will be the primary data in the cloud

Percent of Market



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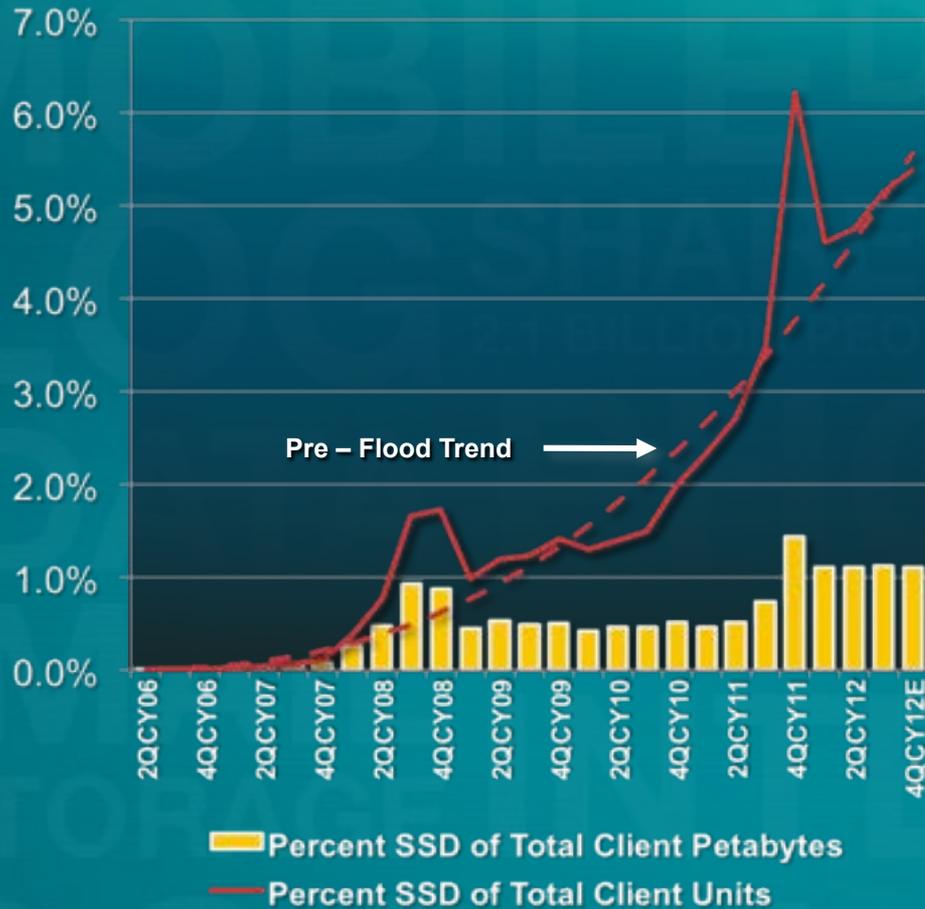
\* All capacity shipped to Business / Mission Critical, Commercial Notebook & Desktop applications

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Source: Seagate Market & Competitive Intelligence

# A Word About the Client SSD Market

**Percent Penetration of Client SSDs**

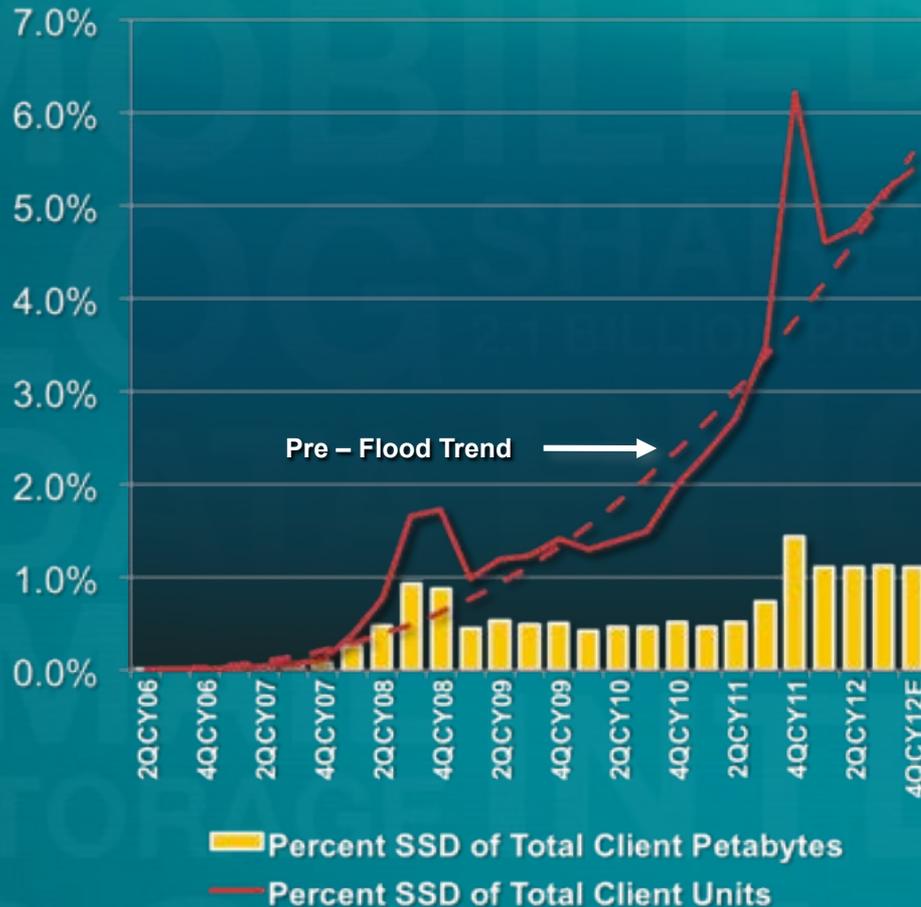


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Source: Seagate Market & Competitive Intelligence

# A Word About the Client SSD Market

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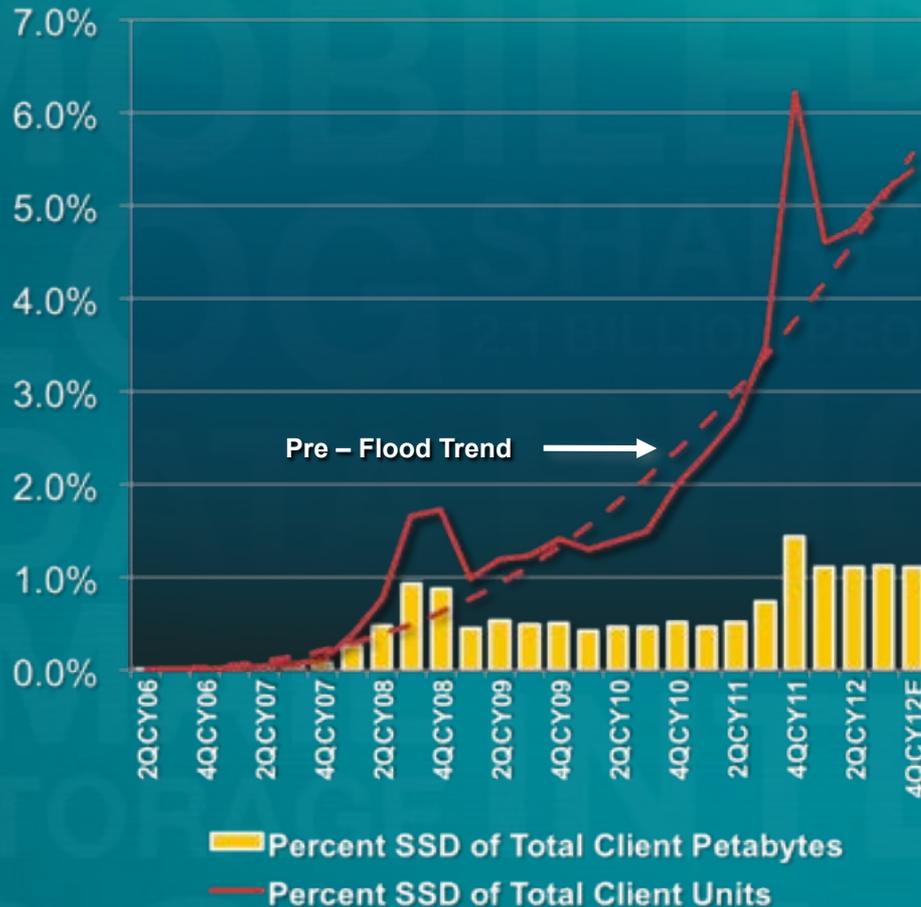


SSD penetration into the client space has been & will continue to be predictable

It returned to the pre-flood trend when the HDD industry recovered

# A Word About the Client SSD Market

**Percent Penetration of Client SSDs**



SSD penetration into the client space has been & will continue to be predictable

It returned to the pre-flood trend when the HDD industry recovered

Forecast for the entire SSD market have proven aggressive

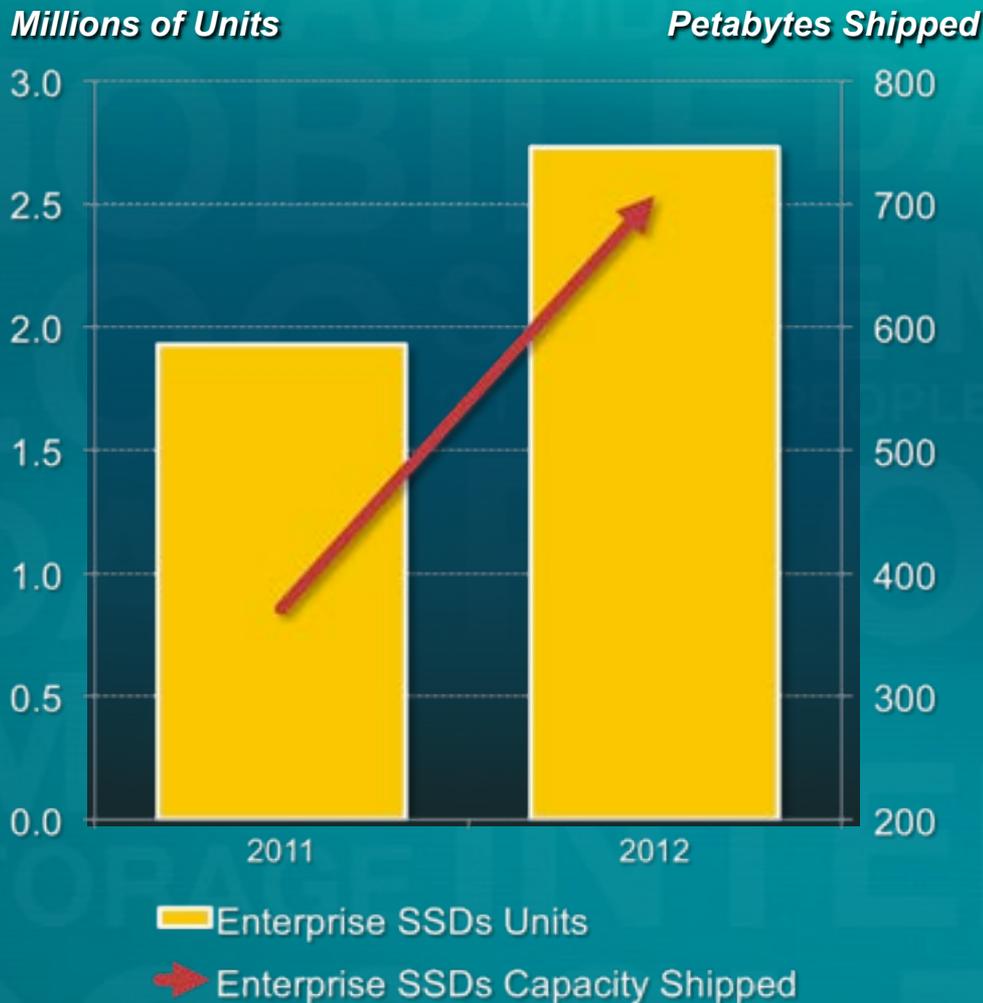
# Enterprise SDDs are Attractive But ...

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Source: Gartner, Seagate Market & Competitive Intelligence

# Enterprise SSDs are Attractive But ...

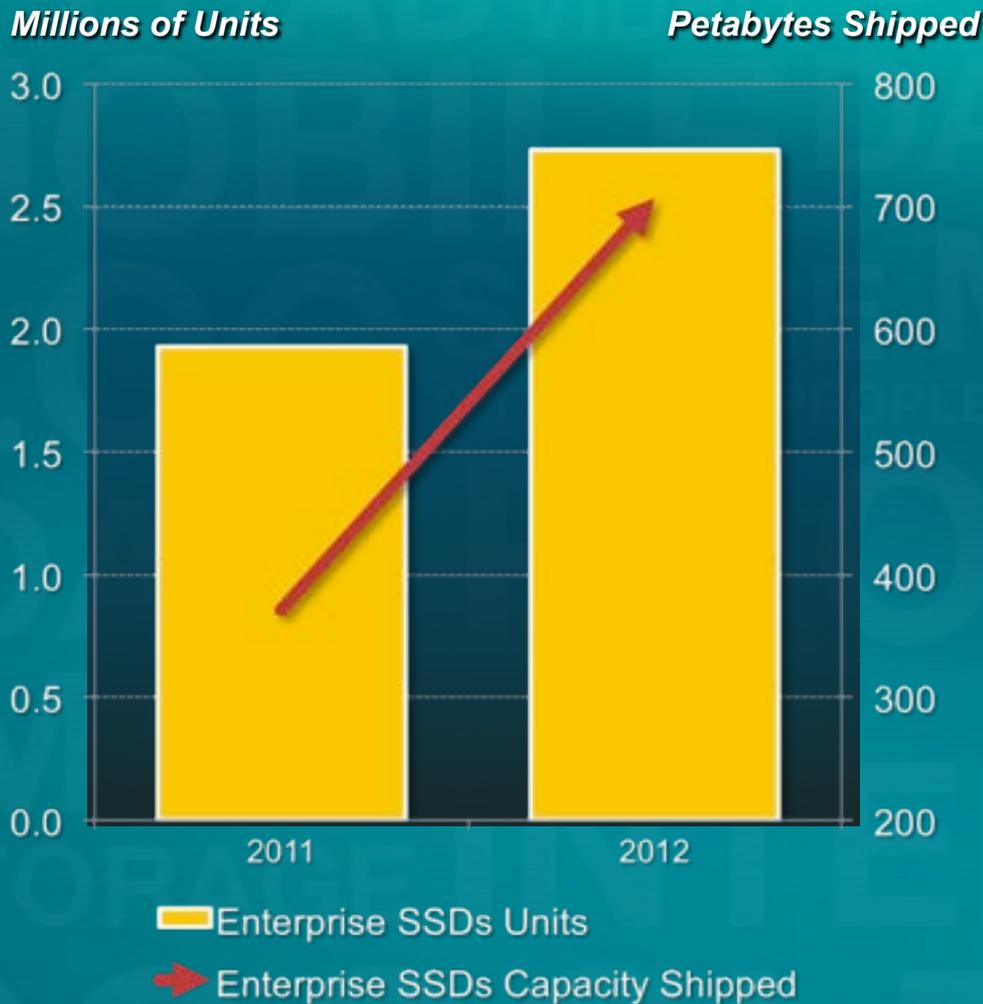


Enterprise SSDs continue to grow in CY12

- Units expected to grow 42%
- Petabytes shipped expected to grow 90%

But you must put this growth into perspective

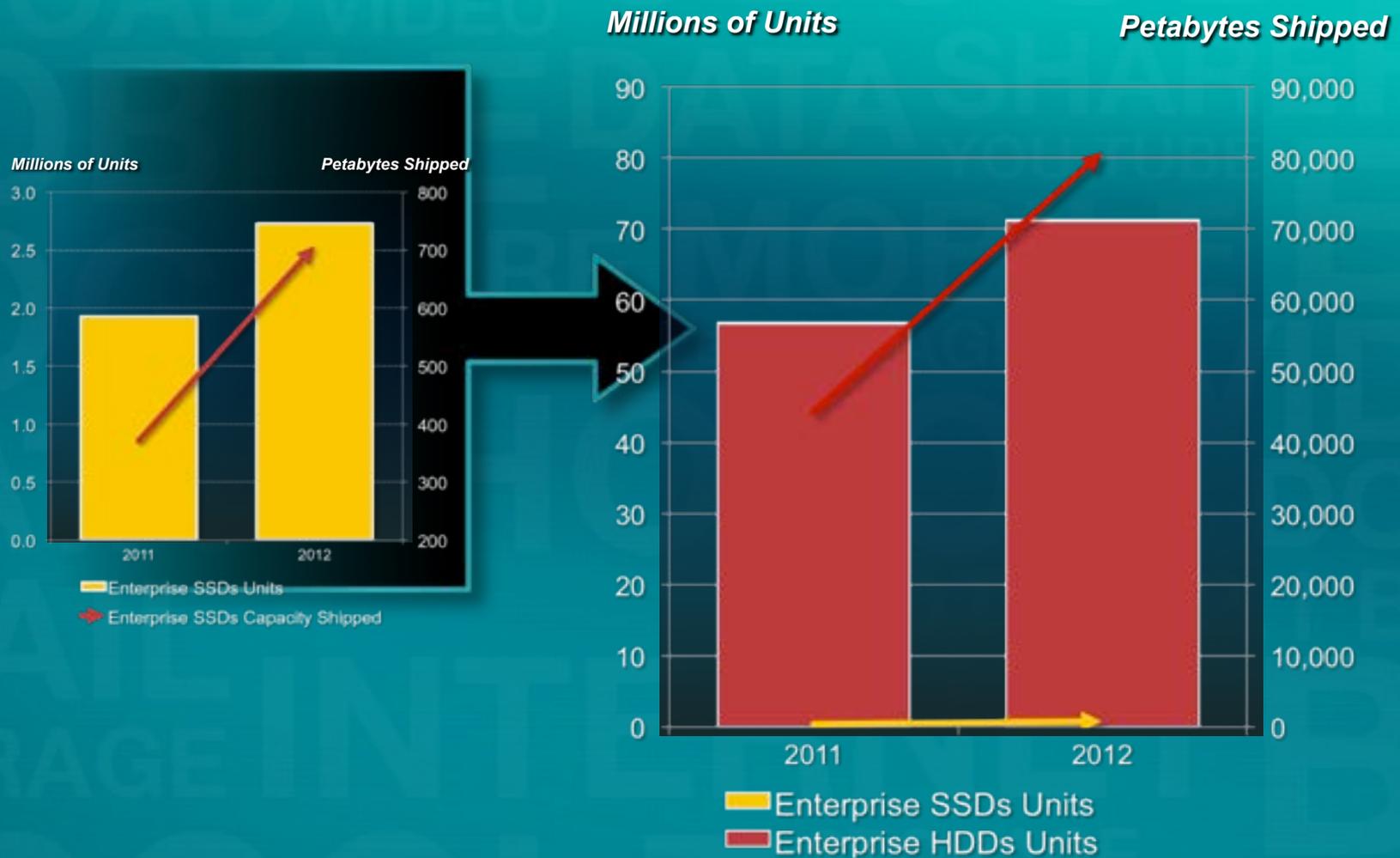
# Enterprise HDDs are Just as Attractive



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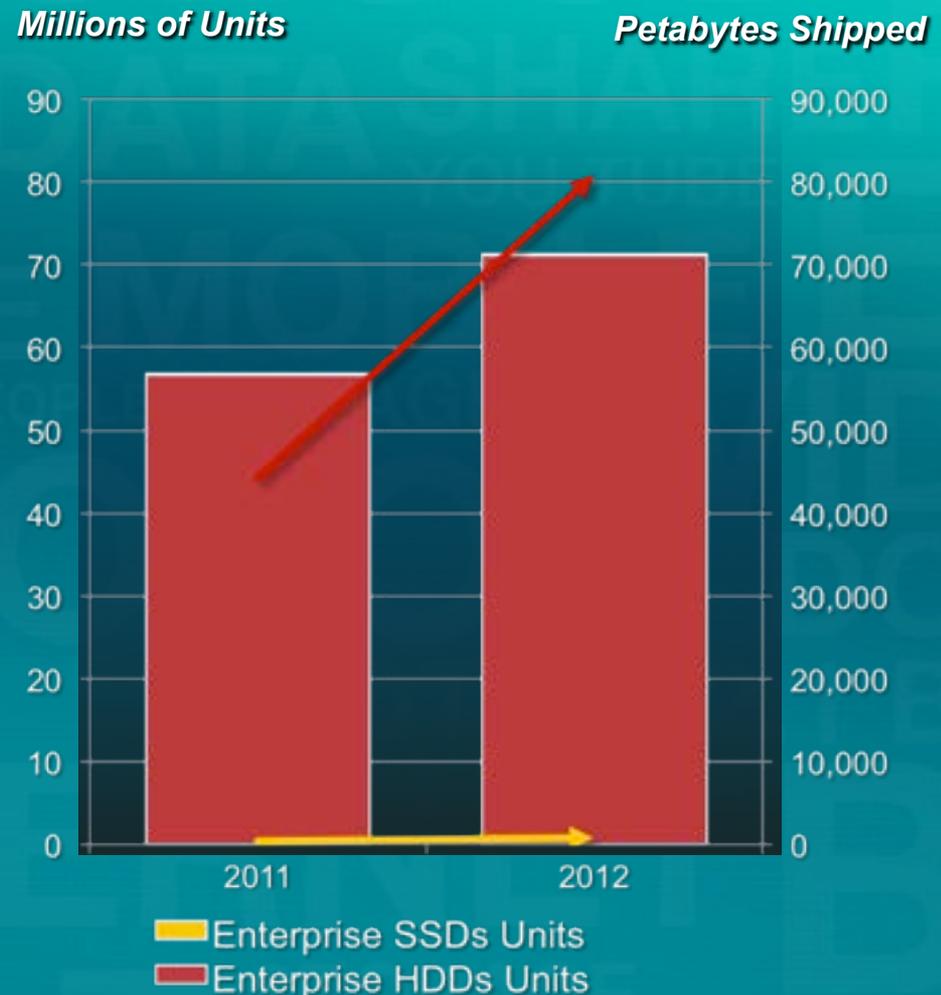
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# Enterprise HDDs are Just as Attractive



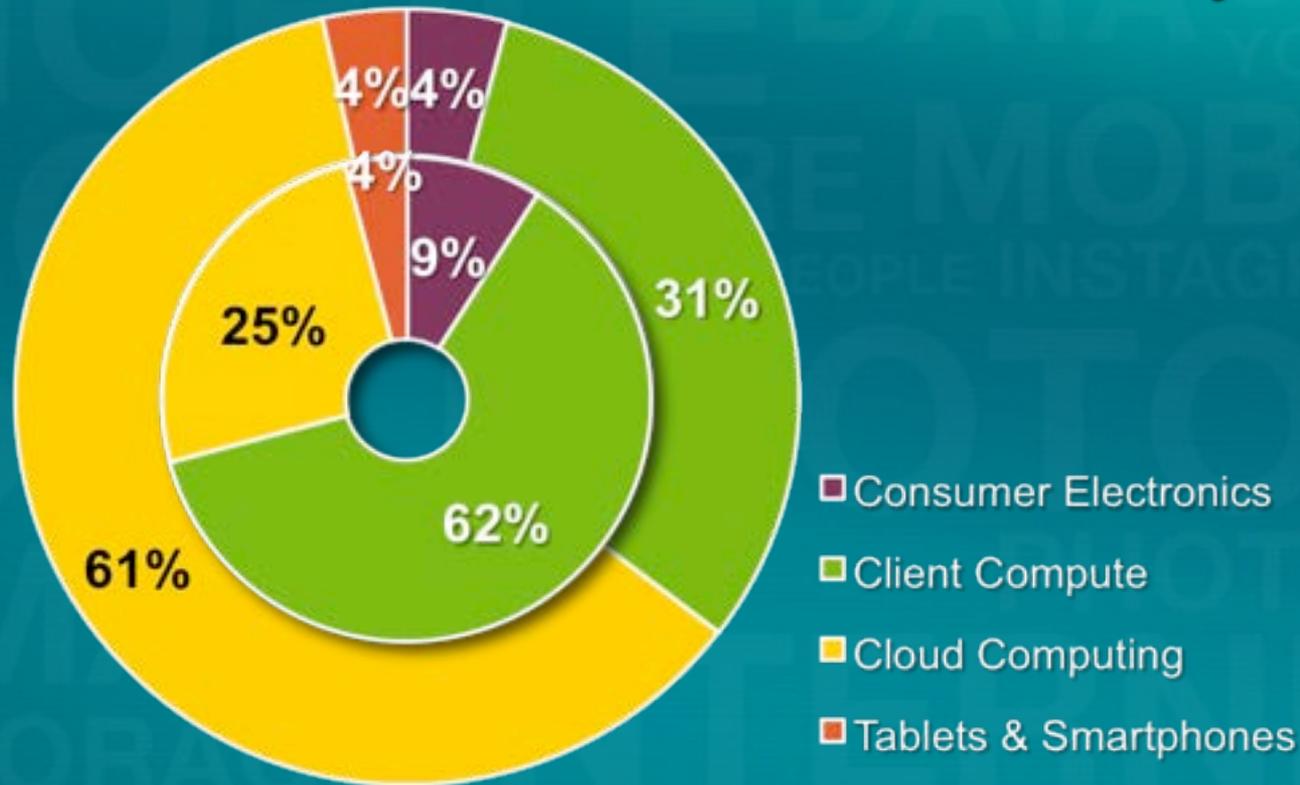
# Enterprise HDDs are Just as Attractive

**This year the Enterprise HDD market will grow 25% in units & 83% in Exabytes - equal to that of the SSD market**



# One Thing is Clear – The Location of Data is Shifting

## *Location of Exabytes Shipped*

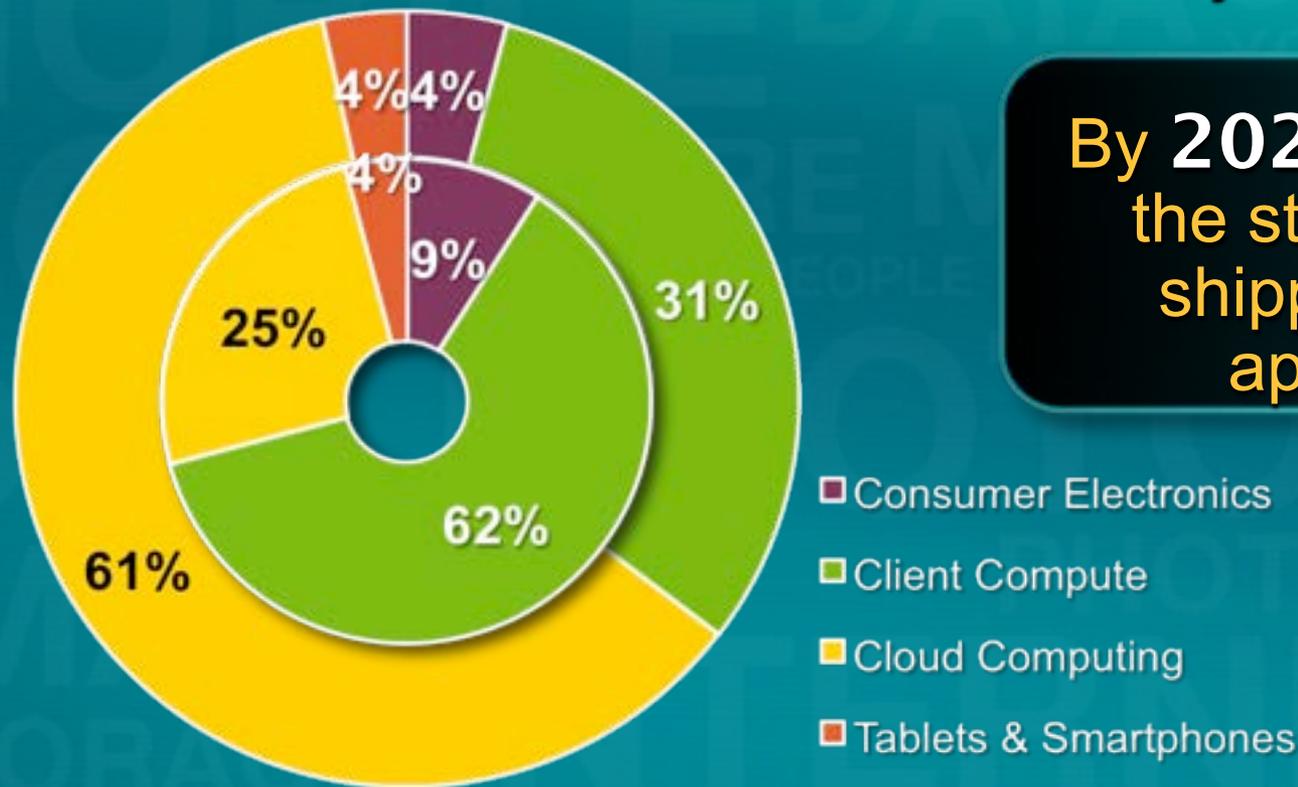


Source: Seagate Market & Competitive Intelligence

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# One Thing is Clear – The Location of Data is Shifting

## Location of Exabytes Shipped



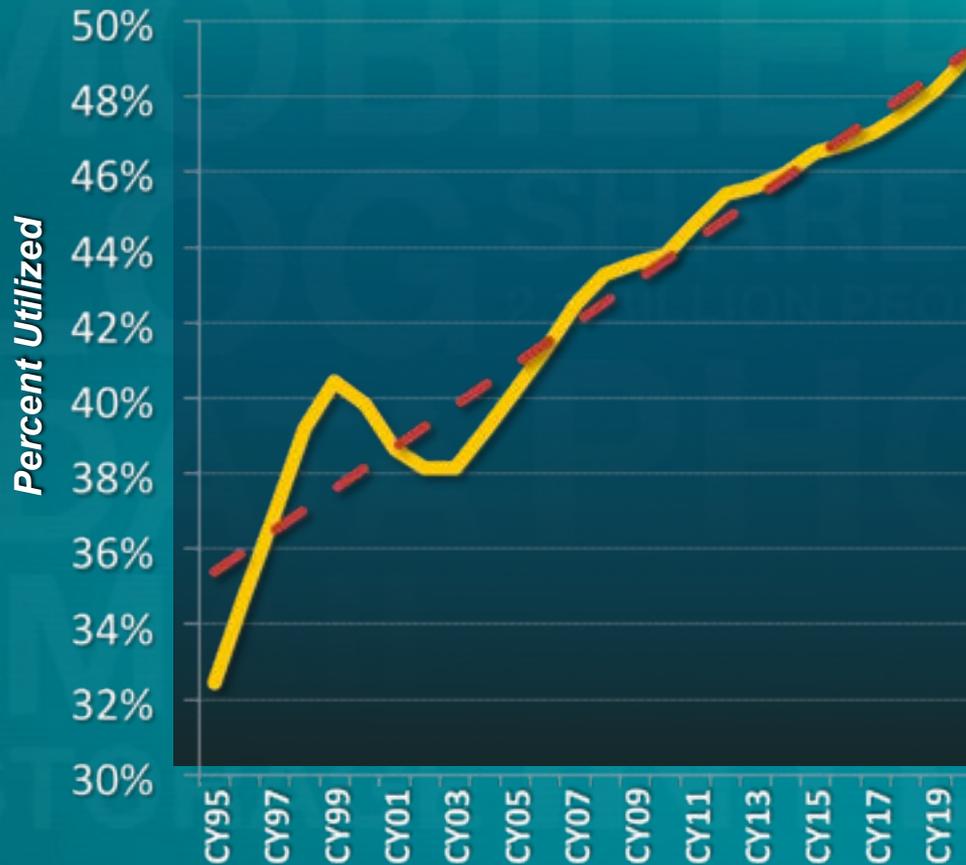
**By 2020** over 60% of the storage will be shipped to cloud applications

Source: Seagate Market & Competitive Intelligence

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# Two Implications of this Move to the Cloud: First the Increased Utilization of the Installed Storage Base

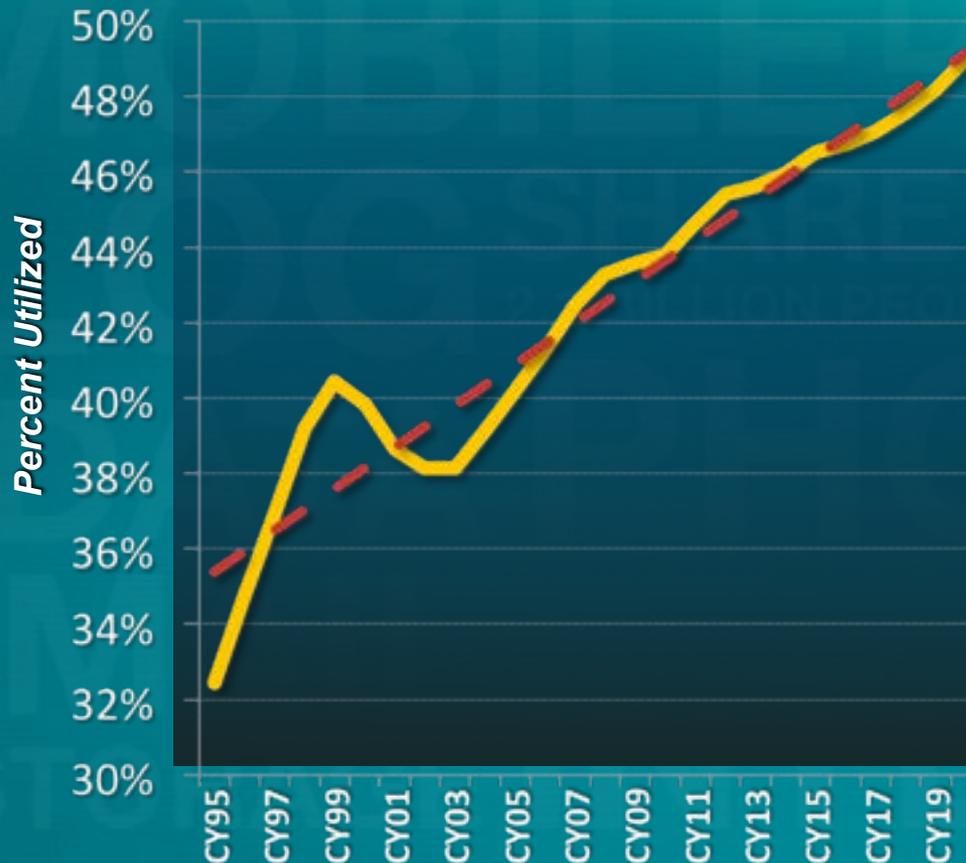
## *Estimated Utilization of the HDD Storage Installed Base*



\* Assume a six year useful life for a hard disc drive; utilization of the client drives average 42% & the utilization of the cloud drives at 62%

# Two Implications of this Move to the Cloud: First the Increased Utilization of the Installed Storage Base

## *Estimated Utilization of the HDD Storage Installed Base*



Applications moving away from single user to multi-user, centralized, efficient environments based on cloud architectures

\* Assume a six year useful life for a hard disc drive; utilization of the client drives average 42% & the utilization of the cloud drives at 62%

# Second – The Capacity Demands of the Cloud Will be Difficult to Fulfill



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# Second – The Capacity Demands of the Cloud Will be Difficult to Fulfill



**Long Term Trends  
working against each  
other**

**The increase creation  
of data & demand for  
storage**

**Slowing technology  
advancements & limits  
to cost reductions**

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# Second – The Capacity Demands of the Cloud Will be Difficult to Fulfill

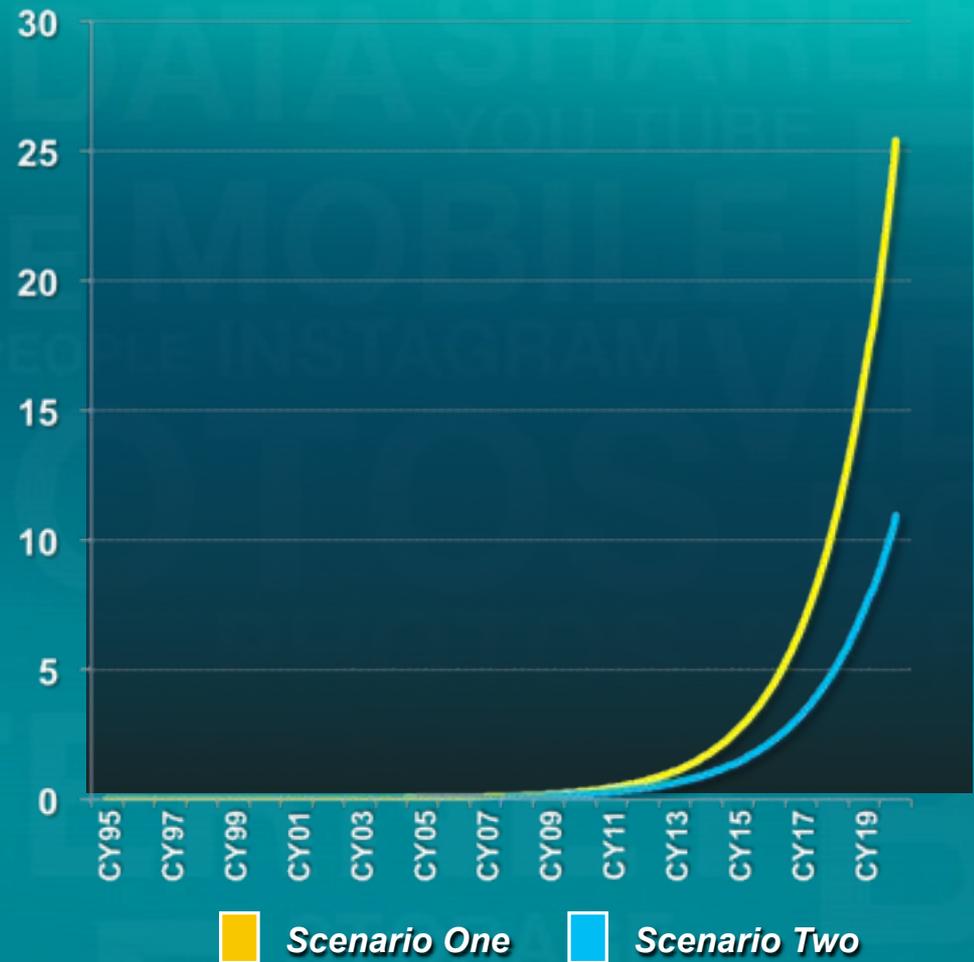


**One has to stop focusing on  
UNITS, and start worrying  
how the industry will  
FULLFILL the demand for  
EXABYTES**

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# Assume the Demand for Storage will Continue to Grow

**Zettabytes Shipped**



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Source: Seagate Market & Competitive Intelligence

# Assume the Demand for Storage will Continue to Grow

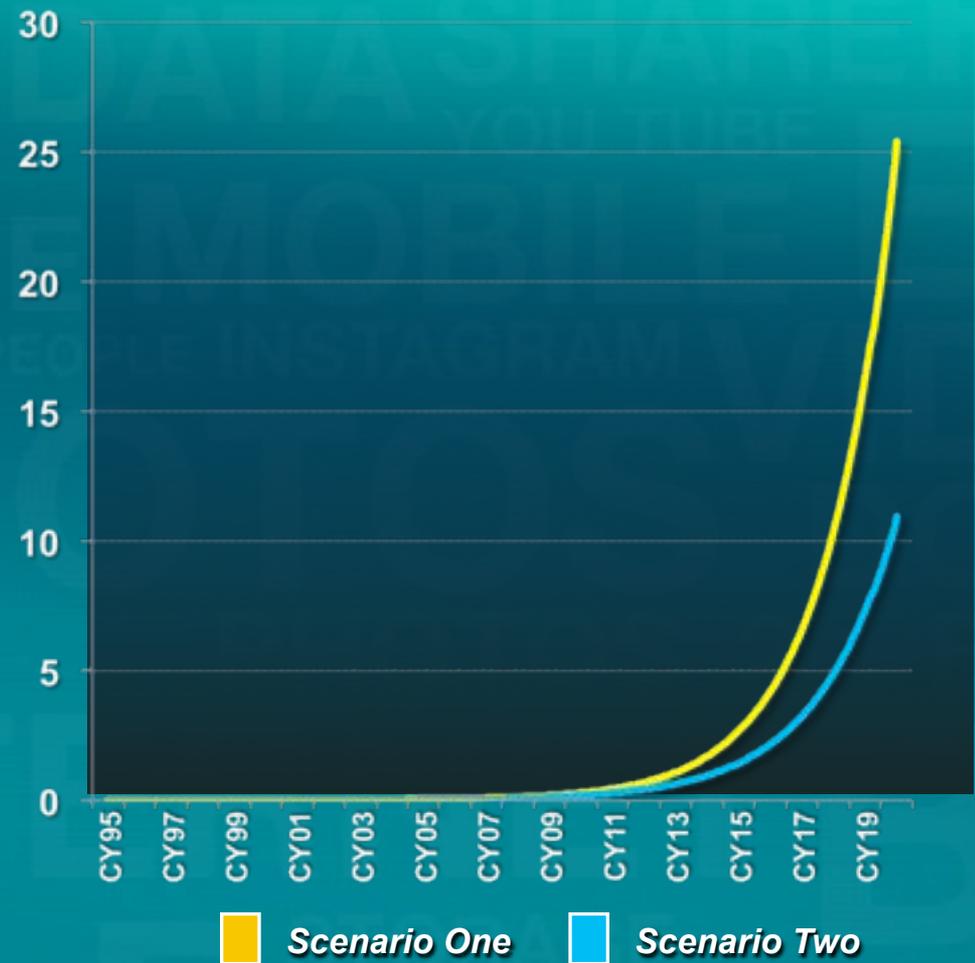
## Scenarios are needed to band the long term demand for storage

Scenario One: Demand grows at the same rate as the 17 years reaching 25 Zettabytes in CY20

Scenario Two: Demand slows to 40% of this historical rate reaching 10 Zettabytes in CY20

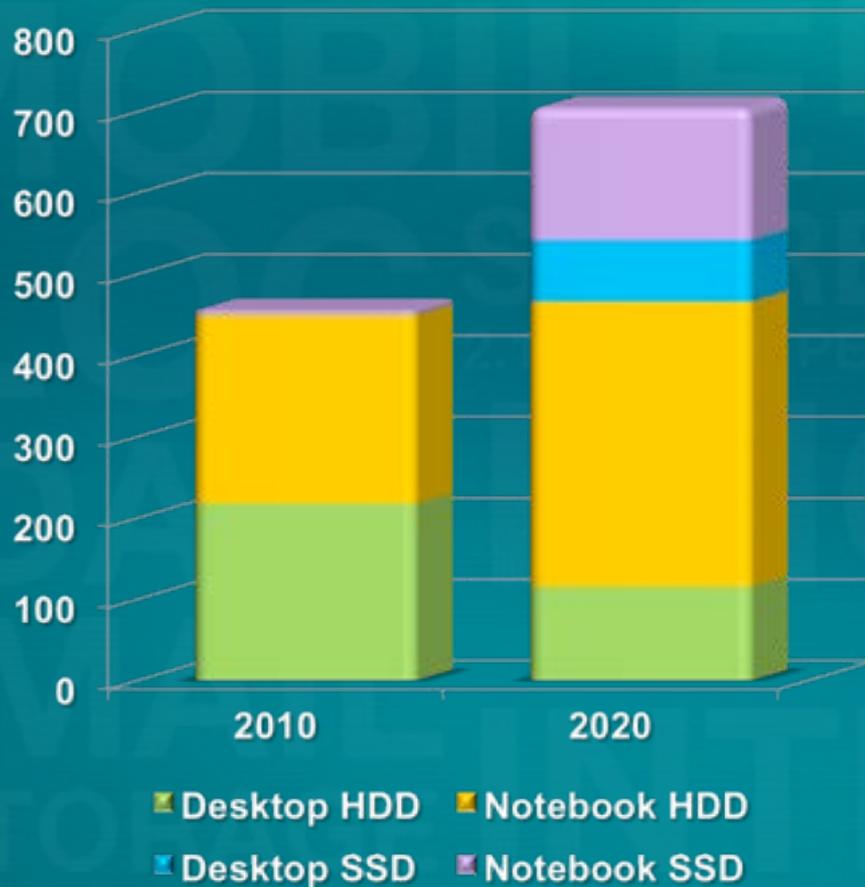
- Assumes data growth can not continue to grow exponentially
- Users will find efficient means to determine how & what to store

Zettabytes Shipped



# Also Assume That SSDs Will be a Significant Player in the Client Space in CY20

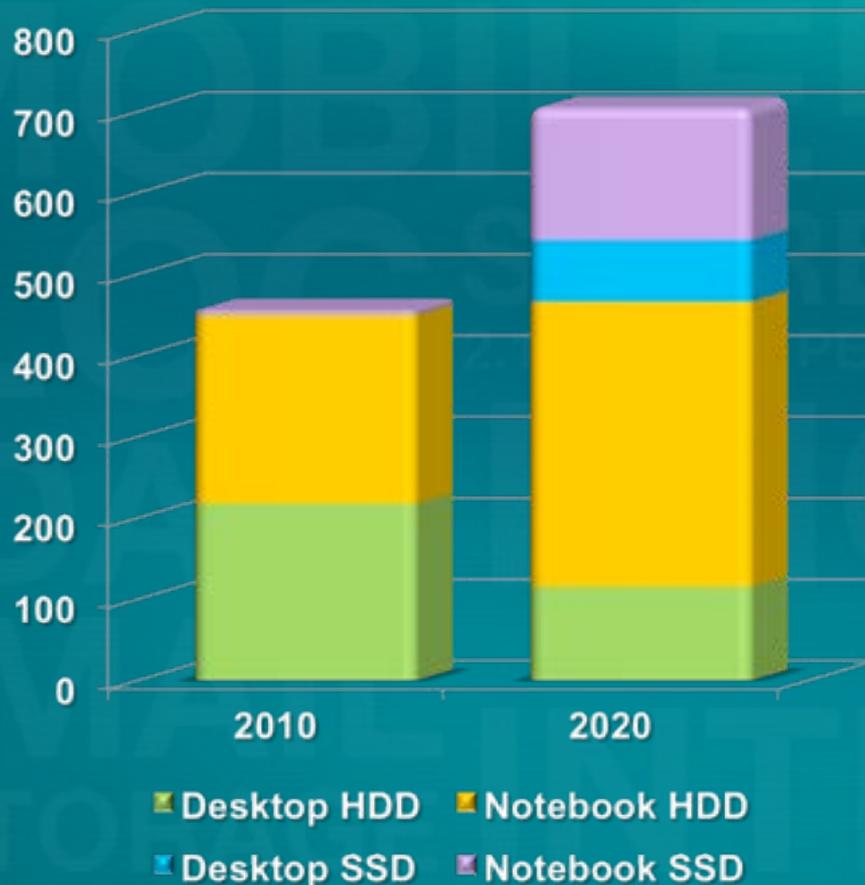
*Units in Millions*



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# Also Assume That SSDs Will be a Significant Player in the Client Space in CY20

Units in Millions



The client space will double in size between CY10 & CY20

Assumptions on CY20 SSD penetration:

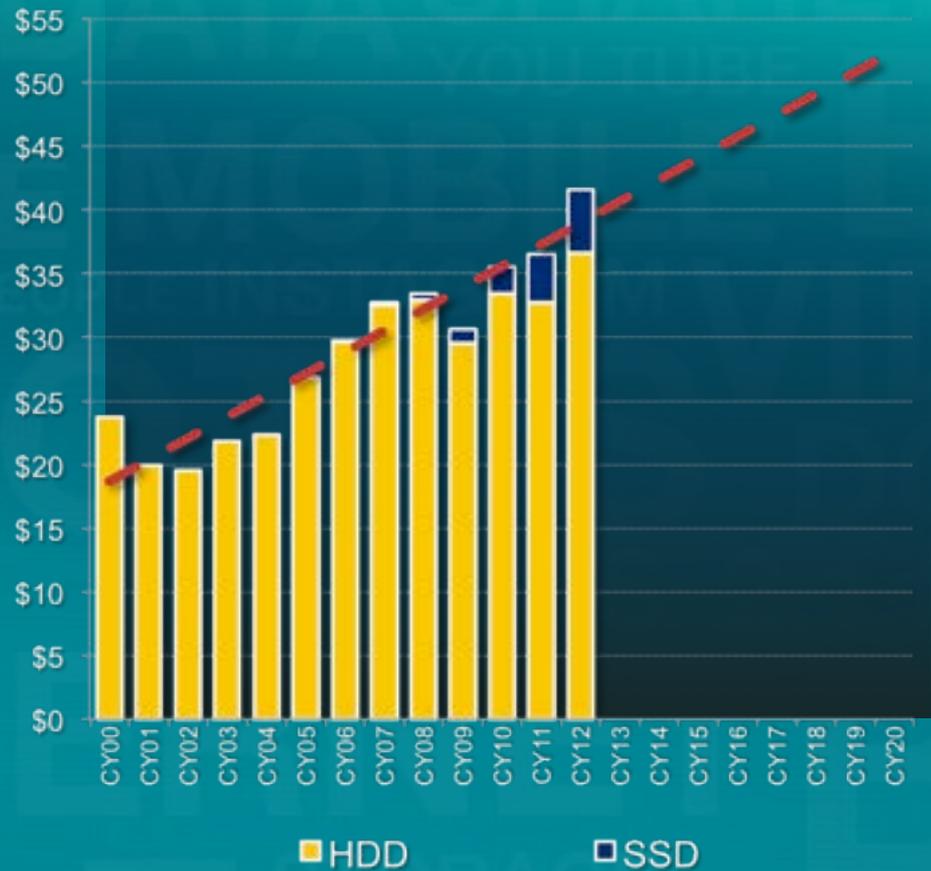
- 80% of all commercial desktop & notebooks
- 20% of all consumer desktop & notebooks

Will require 105 Exabytes of flash & account for \$5.0B in revenue – five cents a GB

The rest of the Zettabytes will need to be provided by HDDs

# Industry Revenue for Mass Storage will Grow at Historical Rates

*Billions of US Dollars*



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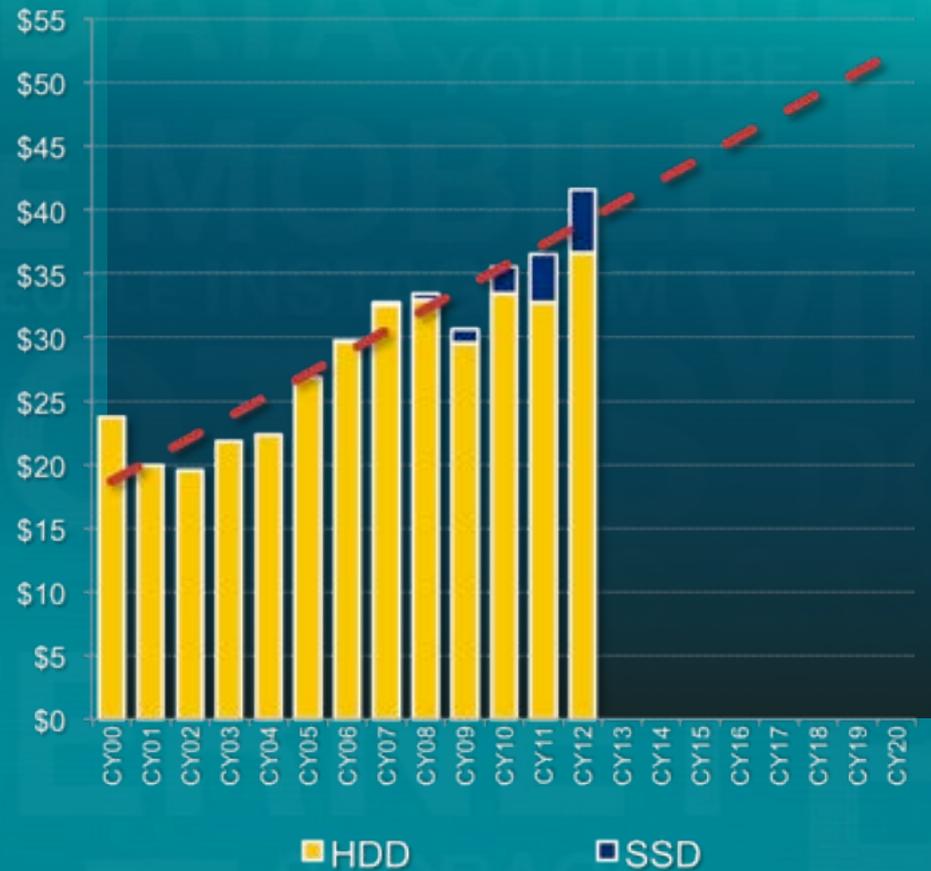
Source: Seagate Market & Competitive Intelligence

# Industry Revenue for Mass Storage will Grow at Historical Rates

Assumes the economics of storage are such to allow this expansion

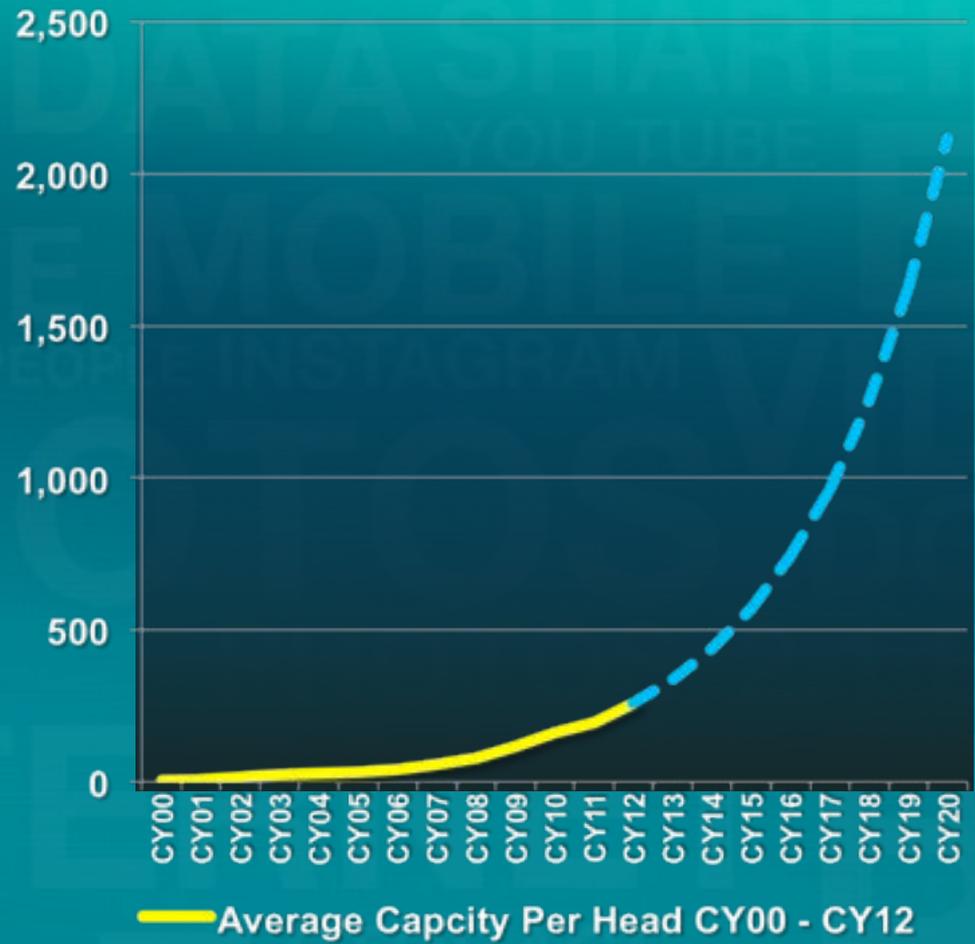
The revenue for mass storage devices will trend to \$50B in CY20

Billions of US Dollars



# For the HDD Industry to Fulfill the 10 Zettabytes in CY20

*Average Gigabyte Per Head*



# For the HDD Industry to Fulfill the 10 Zettabytes in CY20

Will need to produce five billion heads

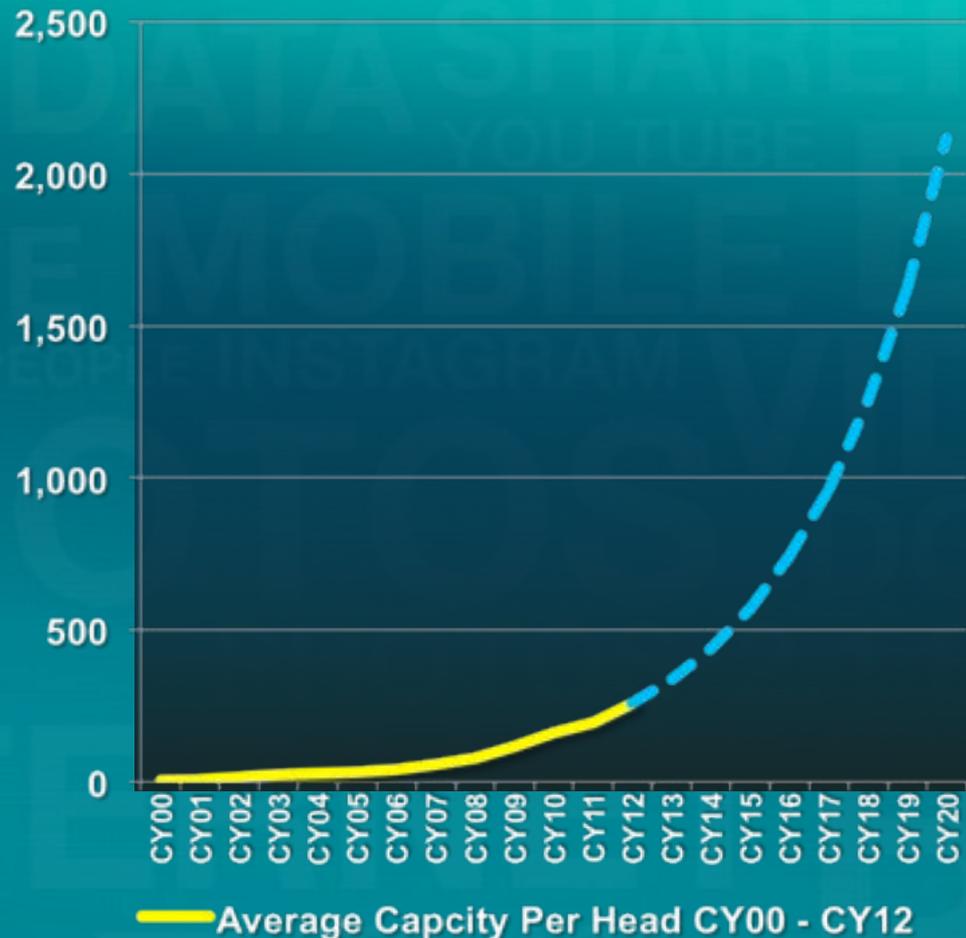
- Assumes 30% areal density, generous
- Roughly 2.5 times current production
- Would require a significant capital investment

Revenue of roughly \$50 billion needed to supply the demanded capacity

- Assumes \$10 revenue per head
- Required a trend towards multiple disc drives

Tension in the system as customers need to balance the desire for capacity & budgets

*Average Gigabyte Per Head*





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# Summary:

- Data growth is putting pressure on the industry's ability to meet demand for mass storage
- SSDs will be an important component of the mass storage industry but will do little to meet the demand for zettabytes
- Choices will need to be made about how to produce & properly deploy storage



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# Capacity to Lead