



2012 – 2018: Storing Lots of Data

(a personal editorial)

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What to Use?

2012: 3 TB HDDs	2015: 5 TB HDDs	2018: 6 TB HDDs
5 PB	5 PB	5 PB
20 PB	20 PB	20 PB
50 PB	50 PB	50 PB

Will SSD's be a consideration? No incentive for NAND suppliers to invest

- In years 2013 – 2015, 300 Exabytes of server HDD storage will ship
- In 2011 NAND fabs had a capacity of about 21 EB, only ~ 2 EB for SSDs
- So, NAND manufacturers should be bursting with output, but

Toshiba cuts NAND production by 30%

Dylan McGrath

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SAN FRANCISCO—Japan's Toshiba Corp. said Tuesday (July 24) it would cut its production of flash memory chips by about 30 percent, effective immediately, due to market oversupply and price declines.



Could SSDs Replace any Significant HDD Capacity?

NAND production capacity as of 2011 21 EB, 2EB for SSDs

	Data Center HDDs	10&15K RPM HDDs
Data Center EB 2013-2015:	300	60
NAND GB/wafer	4000	4000
Wafers needed:	75M	15M
Wafers/fab/3 years	9 M	9M
EB per 3 years/fab(4K*9M)	36	36
Additional fabs needed	8.3	1.66
Fab cost	\$10B	\$10B
Investment required	\$83B	\$16B
Revenue opportunity on 300EB	\$30B!	On 60EB: \$14B!

Revenue/Fab: \$3.6B

\$8.75B



Other Views – a Range of NAND Capability:

	DC	Hi RPM	Gartner	WD May/2012
EB 2013-2015:	300	60	60	60
EB/3 Years/FAB	36	36	11.75	26.4
Additional fabs needed	8.3	1.6	5	2.2
Fab cost	\$10B	\$10B	\$10B	\$10B
Investment required	\$83B	\$16B	\$50B	\$20B
Revenue opportunity	\$30B!	\$14B!		

Sources: Gartner, NAND supply & Demand Report. Dec 2010
 Hetzler (IBM), System Impacts of Storage Trends. FAST 2011 Presentation
 Freitas & Chiu (IBM), Storage Class Memories. FAST 2012 Presentation
 Luczo, Steve. Forbes Magazine Interview. <http://www.forbes.com/sites/ericsavitz/2012/04/12/seagate-ceo-luczo-on-drives-zettabytes-flash-and-his-tattoo/>
http://www.theregister.co.uk/2012/05/09/wd_disk_tech_views/print.html



What about Tape?

It all depends on access density & response time requirements



End points:

- CERN - supercollider data
 - How many are interested, what response time is needed?
 - Tape is an easily understandable choice
- Historical data of broad appeal - the Lamin-Hegeman effect
 - People from all over will find items of interest
 - Companies will make a business out of searching it
 - I think you are going to need direct access



Thank You!

(There aren't any questions, are there?)

