

Mi-Tech Vol. 36: Data Center IT Survey & Key 2016 Storage Trends

Summary

For this, the first edition of Mi-Tech's IT data center survey, we take a look at what we plan to be a bi-annual survey of the IT industry supply chain to gauge storage and technology capex trends driving the future data center roadmap. Our initial survey polled 53 IT industry respondents (CIOs/CTOs/Project/Product managers) on topics such as spending trends, SSDs, HDDs, key players, and technology roadmaps. The key takeaways from our first survey of trackable industry trends are below.

Key Points

Survey Universe. Our survey pooled responses from 53 IT industry respondents including CIOs/CTOs (41% of survey), and Project/Product Managers (58%), with 70% from companies with >500 employees (17% >3000 employees).

Data Center Spending Trends in 2016. Approximately 66% of respondents noted that data center (DC) spend had increased y/y while 26% stated their spending remained the same. For those who saw DC spending increases, approximately 40% saw 2016 DC spending up 11-25% y/y and ~20% seeing DC spending up more than 25% y/y.

2017 Increasing Flash in the Data center and a move to the Cloud; Negative for Storage? For 2017, almost 90% of respondents noting 25% or more of DC spending was on the Cloud. We believe with the cloud growing at a ~23% CAGR there are some challenges for storage, as the cloud drives almost 80% storage efficiency and offsets some of the demand from the local HDD storage, where efficiency is only ~30%, as noted from our call with industry expert Jim Handy ([Link-HDD Call Takeaways](#)). Also, 71% of respondents estimated that more than 25% of data center spend will be on flash SSD.

Key Data Center Flash Suppliers in July 2016; Legacy players getting stronger? When looking at flash suppliers, IBM is far and away the most popular with over 75% of those surveyed noting they saw IBM as one of their most important players. SanDisk and Samsung were also recognized as key players in the market, garnering votes from 47% and 40% of respondents, respectively. IBM also came out on top as the company that was viewed as most innovative within the data center, with 64% of respondents, and Samsung as #2 in this segment with 60% of responders, while SanDisk rounded out the top 3 with 38%. We continue to see INTC, NVDA, and storage OEMs MU and WDC as key beneficiaries of the flash and cloud spending in the DC. For more, read on.

Company	Symbol	Price		Rating	
		(7/26)	Prior	Curr	PT
Micron Technology, Inc.	MU	\$14.67	-	Buy	\$14.00
Seagate Technology PLC	STX	\$32.45	-	Neutral	\$23.00
Western Digital Corp	WDC	\$53.74	-	Buy	\$53.00

Source: Bloomberg and Mizuho Securities USA

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Data Center Supplier: The Winners and Losers in Data Center Spending. Our first survey points to continued traction at the traditional majors such as IBM and Samsung benefiting from increased data center spending, while WDC, SanDisk, and STX are also seeing increased spending trends. Micron was a net gainer, attracting new increased Enterprise data center spend. EMC showed a much smaller increase in spending in the survey versus almost all the peers listed above.

Technology Roadmaps. As can be expected, three of the top DC trends are: 1) the adoption of the Public Cloud, **2)** increased SSD/Flash, **and 3)** Increasing server flash with use of NVMe/PCIe.

Emerging White Box and System Integrators. With increasing Hyperscale and cloud OEMs driving DC spending, we believe white box and system integrators are seeing increased traction. Almost 70% of those surveyed noted the use of white box OEMs with ~40% of those surveyed using Quanta, 32% using Compal, and 30% used ZT Group. While 32% of the respondents did not use a white box storage OEM, an overwhelming 70% now use White Box OEMs, underlining a trend that has been ongoing for a while.

A deeper look begins on the next page.

Mizuho MSUSA Data Center IT Survey

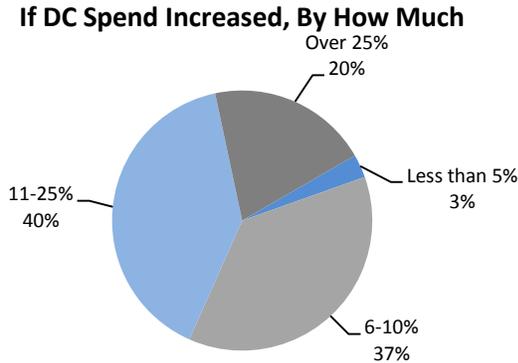


Source: centergrid.com

2016 Data Center Spending Trends

Data center spending looks to be up y/y, with 60% of respondents noting overall DC spending is up at least 10% since last year. Only 3% reported an increase of less than 5% y/y.

Exhibit 1: Data Center Spending versus Last year – July-2016

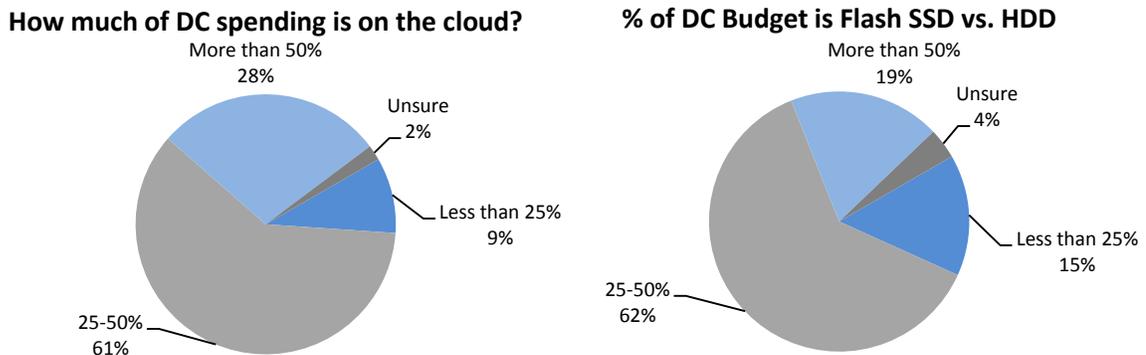


Source: MSUSA Data center Survey Data, Mizuho Securities research

Cloud and Flash SSD Spending in the Data Center

For 2017, almost 90% of respondents noted 25% or more of DC spending was on the cloud, with almost 1/3 of overall respondents stating over 50% of their spending is on the cloud. We believe with the cloud growing at a ~23% CAGR there are some challenges for storage, as the cloud drives almost 80% storage efficiency and offsets some of the demand from the local HDD storage, where efficiency is only ~30%, as noted from our call with industry expert Jim Handy ([Link-HDD Call Takeaways](#)). Also 71% of respondents estimated that more than 25% of data center spend will be on flash SSD.

Exhibit 2: Cloud and Flash SSD Spending in the Data center

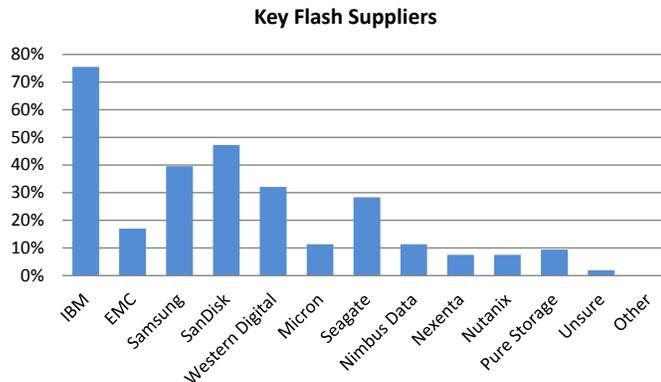


Source: MSUSA Data center Survey Data, Mizuho Securities research

Key Data Center Flash Suppliers

Within the data center suppliers, respondents reported a few standout flash players. The biggest was IBM, with 70% of those surveyed noting IBM as key, followed by SanDisk and Samsung at 40-50% of the supplier base. We believe this is notable as the supply balance appears to be moving from the IT heavyweights like EMC/IBM to OEMs such as Samsung/SanDisk/WDC.

Exhibit 3: Key Data Center Flash Suppliers

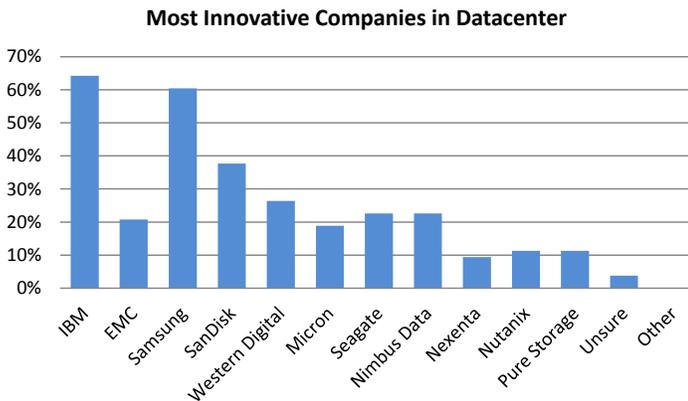


Source: MSUSA Data center Survey Data, Mizuho Securities research

The Innovators in the Data Center

Again, IBM, Samsung, and SanDisk (WDC) are viewed as the three most innovative among the data center suppliers. We would note while many of the newer players garnered votes, they appear to be lower down the scale, though this might be also a result of just being new and emerging in a very established industry.

Exhibit 4: Innovation Among the Data Center IT Suppliers



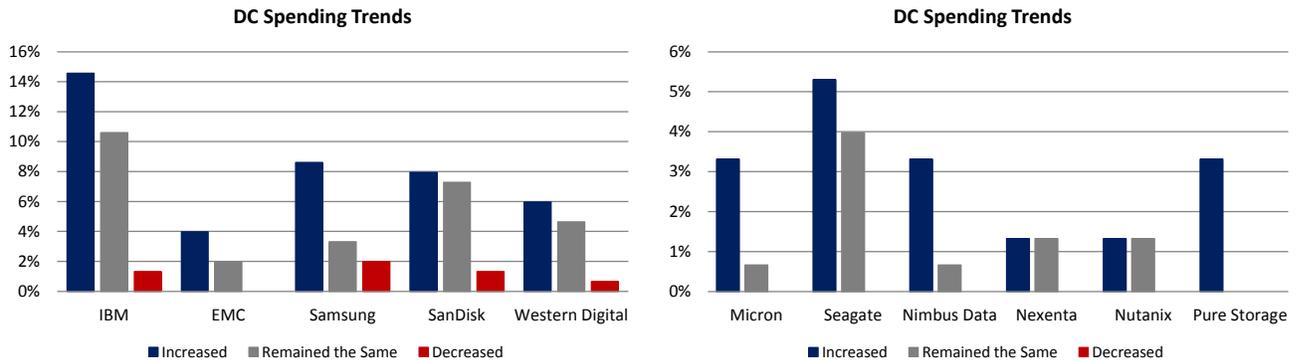
Source: MSUSA Data center Survey Data, Mizuho Securities research

The Winners and Losers in Data Center Spending

We believe this is the litmus test. Some of the legacy majors such as IBM, Samsung, SanDisk and even WDC are seeing increased spending with 8-14% of respondents saying they increased spending allocation to the four. In comparison, while MU did see a net 3% new respondents saying they increased data center procurements and should be a positive given a renewed enterprise focus, overall some of the newer players (on right hand chart below) seem to see an underwhelming increase in DC spending benefit in our survey. Nonetheless, we would underscore that this data center spending survey is by no means comprehensive and is meant to reflect a slice of the spending trends in the industry.

IBM, Samsung, SanDisk, and WDC continue to stand out in this portion of the survey as well, with ~50-60% of users maintaining or increasing procurement at these suppliers.

Exhibit 5: The Major Data Center Spending Trends – Winners and Losers



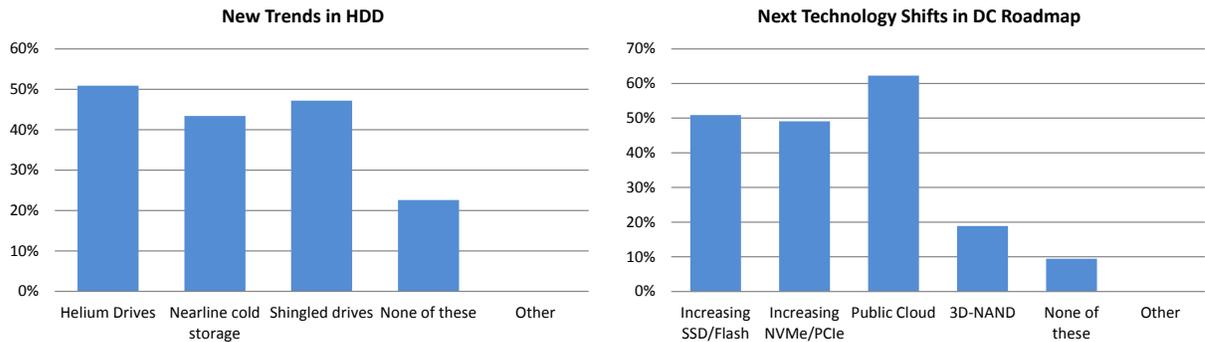
Source: MSUSA Data center Survey Data, Mizuho Securities research

Key HDD and Data Center Technology Trends

Within HDD, the most common new trend among IT professionals is the helium filled drives. We also believe there will be significant trends within near-line/cold storage as well as shingled drives. As we had noted in our prior industry call note, shingled magnetic drives (SMR) has driven almost 30-70% increased areal density in HDD, which could drive potentially reduced future near-line units with the substantial increased density. Average HDD density in enterprise drives for nearline are jumping from 2-4TB to 8-10TB drives with the aid of new SMR technologies, but the flip side could be the use of reduced units.

In the data center, the Public Cloud is the key technology shift among those surveyed, which can be expected given the level of increased spending on the cloud which we discussed earlier.

Exhibit 6: New Trends and Technology Shifts



Source: MSUSA Data center Survey Data, Mizuho Securities research

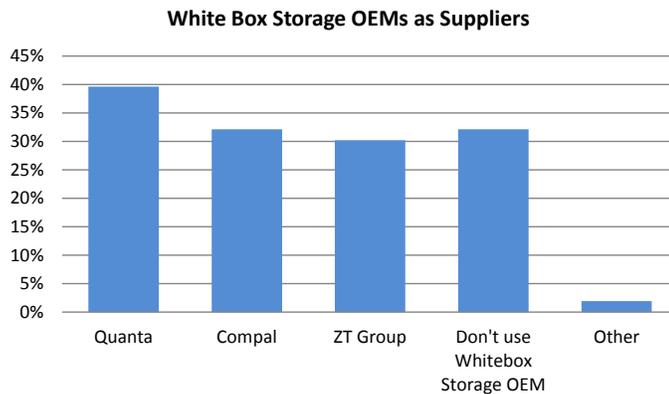
The Move to White Box OEMs, and Hello System Integrators!

With increasing Hyperscale and cloud OEMs driving DC spending, we believe white box and system integrators are seeing increasing traction.

Almost 70% of those surveyed noted the use of white box OEMs. Among those, ~40% of those surveyed used Quanta, 32% used Compal, and **30% used system integrators such as ZT Group that potentially put hybrid HDD and SSD systems to substitute for mission critical or performance systems.** As we show below, among White Box OEMs, Quanta was the most used, followed closely by Compal and ZT Group.

While 70% of the respondents were using while box OEMs, approximately 30% of those surveyed did not use White Box OEMS instead using the traditional OEM route, but this seems to be becoming a scarcer minority and will be interesting to track in further surveys.

Exhibit 7: Key White Box Data center Suppliers



Source: Mizuho Securities estimates, MSUSA Data center Survey

<i>Vol.</i>	<i>Past Editions</i>	<i>Date</i>
IV	<u>Global Automotive OEMs - Electrification and ADAS</u>	June 30, 2015
V	<u>3D-NAND – Are we there yet?</u>	July 7, 2015
VI	<u>Why 2016 Should be Another Year of Strong RF Growth</u>	July 27, 2015
VII	<u>A Look at the EMV Ramp in the U.S.</u>	Aug. 6, 2015
VIII	<u>Payments Takeaways - Strong 2016 with China, NFC, and U.S. EMV</u>	Aug. 16, 2015
IX	<u>Display OEMs Join In-Cell; SYNA Well Positioned</u>	Sept. 13, 2015
X	<u>Global Auto Sales through August; We Like NXPI, CY, ON</u>	Sept. 17, 2015
XI	<u>Why You Should Buy Integrated RF Suppliers AVGO, SWKS, and QROV</u>	Sept. 22, 2015
XII	<u>Handset RF Outlook - A Changing Landscape</u>	Nov. 13, 2015
XIII	<u>Takeaways from our NAND Call: The Enterprise Roadmap</u>	Nov. 13, 2015
XIV	<u>SYNA and FPC: The Mobile FP and Biometrics Landscape</u>	Nov. 22, 2015
XV	<u>In NAND, 3D is Key as TLC becomes so "last year"</u>	Nov. 29, 2015
XVI	<u>Samsung 18nm DRAM in mid-2016?</u>	Nov. 29, 2015
XVII	<u>Fingerprints: A Call with the King</u>	Dec. 3, 2015
XVIII	<u>Strong November 4G Adds, China 5/6 mode 2016 Tailwinds</u>	Dec. 28, 2015
XIX	<u>Autos - A Tax Cut (China) and 2017 Hike (Japan)</u>	Jan. 3, 2016
XX	<u>ADAS Gets a Disruptive Quanergy Boost; Positive for NXPI, CY, ON</u>	Jan. 21, 2016
XXI	<u>A Look at the Challenged PC and Storage Markets</u>	Jan. 25, 2016
XXII	<u>Storage Weak - SSD/HDD and a Strong Yen</u>	Feb. 15, 2016
XXIII	<u>Quanergy Accelerates ADAS and 3D-Mapping</u>	Feb. 21, 2016
XXIV	<u>China 4G Transition from 2G Gaining Steam</u>	Feb. 28, 2016
XXV	<u>NXPI-Apple Pay with CUP Drives Mobile Payments</u>	Feb. 28, 2016
XXVI	<u>Fingerprints and NFC-China Driving Growth with Payments</u>	Mar. 16, 2016
XXVII	<u>A Look at the Virtual Reality Roadmap with AMD</u>	Mar. 20, 2016
XXVIII	<u>A 3D-NAND and SSD Industry Update, and the HDD Roadmap</u>	Mar. 22, 2016
XXIX	<u>Huawei - Key Handset & Carrier Takeaways</u>	Mar. 31, 2016
XXX	<u>A Preliminary Look at VR; Closing in on Gaming</u>	May 11, 2016
XXXI	<u>Magna Takeaways; Focus on NXPI, CY and ON</u>	May 12, 2016
XXXII	<u>Tailwinds from Automotive Sales and AEB</u>	June 13, 2016
XXXIII	<u>Previewing Huawei, a Global Telecom and Networking Juggernaut</u>	June 15, 2016
XXXIV	<u>Updated Memory/HDD Model; Stable DRAM into 2017</u>	June 20, 2016
XXXV	<u>BREXIT - What's Next for Autos?</u>	June, 26 2016

Glossary

~ - approximately	eMCP - embedded multi-chip module using DRAM and NAND	IoT - internet of things	nm - nanometer	RSP - Renesas Semiconductor products/Drivers
1H/2H - first half/second half	EMV - Europay, MasterCard and Visa, a payment consortium	IP - intellectual property	NOL - Net Operating Losses	RSU - Restricted Stock Units
2G/3G/4G - 2nd generation, third generation, 4th generation wireless	EOY - end of year	ISM - Institute for Supply Management	NOR - a type of non-volatile storage memory	SAS - serial attached SCSI (small computer system interface)
3G/4G - Third generation / Fourth generation	EPS - earnings per share	ITU - International Telecommunication Union	NPV - net present value	SAW - surface acoustic wave filters
4G-LTE - Fourth generation, long term evolution	ET - envelope tracking	JPY - Japanese yen	NVMe - Non-volatile Memory Express	SDH - Synchronous Digital Hierarchy, mostly in Europe
ADAS - Automotive driver assist systems	ETD - Emerging Technologies Division	JV - joint venture	NYSE - New York Stock Exchange	SG&A - Sales, General and Administrative
APU - accelerated processing unit	EU - European Union	K - Thousand	ODM - original design manufacturer	SLAC - subscriber line audio-processing circuit
ARM - a family of instruction set architectures used for processors for computers, servers, etc.	EV - enterprise value	Kbps/Mbps - Kilobit per second/Megabit per second bandwidth	OEM - original equipment manufacturer	SLIC - subscriber line interface circuit
ASIC - application specific integrated circuits	EvDO - Evolution Data Only	KGD - Known Good Die	OFN - optical finger navigation	SMIC - Semiconductor Manufacturing International Corporation
ASP - average selling price	EVP - Executive Vice President	Kwpm - thousand wafer per month capacity	OLT - Optical Line Termination or Terminal	SoC - system on chip
ATM - Asynchronous Transfer mode	F - Fiscal	LIBOR - London Interbank Offered Rate	OM - operating margin	SONET - Synchronous Optical Network, used in North America
B - Billion	FASB - Financial Accounting Standards Board	LQ - last quarter	ONU - Optical Network Unit	SOX - Philadelphia semiconductor index
BAW - bulk acoustic wave filters	FBAR - film bulk acoustic resonator, a type of filter	LSD - low single digits	Opex - operating expenses	SRAM - static random access memory
BiDi - Bi Directional	FBAR/BAW - Film Bulk acoustic resonator/Bulk acoustic wave Filters	LT - long term	P/B - price to book value ratio	SSD - solid state drive
BOM - bill of materials	FCF - free cash flow	LTE - long term evolution, a 4th generation wireless protocol	P/E - price to earnings	TAM - total available market
bps - basis points	FDD LTE - Frequency Division Duplex Long Term Evolution	LY - last year	P/S - price to sales	TD - time division
CA - carrier aggregation	FP - finger print	m - Meters	PA - power amplifier	TDDI - touch display driver integration
CAGR - compound annual growth rate	FPGA - field programmable gate arrays	M - Million	PAD - power amplifier duplexer, essentially 2 filters and a Power amplifier	TDD-LTE - Time Division Duplex Long Term Evolution
CAPEX - capital expenditures	FT - force touch	M&A - mergers and acquisitions	PC - personal computer	TD-SCDMA - Time Division Synchronous
CDMA - code division multiple access	FTC - Federal Trade Commission	MB - megabyte	PCIe - Peripheral Component Interconnect Express	TLC - triple level cell
CEO/CFO - Chief Executive/Chief Financial	FY - fiscal/full year	Mbps - megabit per second	PMI - Purchasing Managers' Index	Tx/Rx - Transmit / Receive
CES - consumer electronics show	GAAP - generally accepted accounting principles	MCU - micro controller unit	PMIC - Power Management Integrated Circuit	USB - universal serial bus
CF - cash flow	Gb/GB - gigabytes/Gigabit	MHz - megahertz	PoE - Power over Ethernet	wpm - wafer per month
CFIUS - Committee on Foreign Investment in the United States	Gb/s - Gigabit per second	MIIT - China Ministry of Industry and Information Technology	PSD - Programmable systems division	x86 - Intel based processor architecture
COO - Chief Operation Officer	GF - Global Foundries	MIMO - multiple in, multiple out	PSoC - programmable system on a chip	XMC - Wuhan Xin Xin Semiconductor Manufacturing Corporation
CSP - chip scale packaging	GHz - gigahertz	MLC - multi level cell	PT - price target	y/y - year over year
CY - calendar year	GM - gross margin	MoE - merger of equals	Q - quarter	YE - year end
D/E - debt to equity	GPU - graphics processing unit	MOFCOM - Ministry of Commerce People's Republic of China	q/q - quarter over quarter	YTD - year to date
DCF - discounted cash flow	GSM - Global System for Mobile Communication	MSD - mid single digits	QCT - Qualcomm chip technologies	
DoD - Department of Defense	HDD - hard disk drive	MSM - multi station modems, QCOM's QCT chips	QTL - Qualcomm technology licensing	
DRAM - dynamic random access memory	HSA - heterogeneous system architecture combining x86 and ARM	NAND - "not and," a type of memory	R&D - research and development	
DT - desktop	HSD - high single digits	NB - notebook	Rev - revenues	
eMMC - Embedded managed NAND solution	I/O - input output operations	NDRC - National Development and Reform Commission in China	RF - radio frequency	
EBITDA - earnings before interest, taxes, depreciation and amortization	IC - integrated circuits	NFC - near field communications	ROI - return on investment	

Price Target Calculation and Key Risks

Micron Technology, Inc.

Price Target: We have MU rated Buy with a \$14 PT, ~27.5x our F17E EPS, but we believe a more inline 1.2x P/B for organic MU and 0.92x P/B including Inotera. MU has traded between 0.7x-1.5x P/B over the last 5 years.

Risks: Micron competes globally in a highly cyclical and technology intensive market.

Key risks include:

- Memory ASP declines and cyclical;
- Competitive and market share pressures;
- Increased industry memory Capacity and increased Capex from Samsung, Hynix;
- Slower 20nm DRAM ramps, higher costs or yield issues;
- Slower NAND improvement and/or 3D-NAND yield issues affecting ramps; and
- Other macro-economic, litigation, competitive, currency and technology risks.

Seagate Technology PLC

Price Target. We have STX with a PT of \$23, a 11.6x P/E of our F2017EPS of \$1.99. STX has consistently focused on shareholder returns, strong FCF with a ~8% dividend yield with dividends growing 10% annually. Nonetheless, we are staying on the sidelines with a Neutral, given near-term weak HDD seasonality into 1H16, a weaker 1H16 PC-DT market, and downside on NAND pricing and margins, given seasonality and lack of strong enterprise SSD roadmap especially as Samsung and Intel ramp 3D-NAND.

Risks: STX competes in a cyclical, technologically intensive industry and sells to a concentrated customer base. Its ability to meet its own or our financial expectations and achieve future growth is subject to a number of risk factors, including, but are not limited to, the following:

- Little access to in-house NAND supply and no control on the NAND technology roadmap;
- Competition from Samsung with a 2-year 3D-NAND manufacturing lead;
- Competition from new technologies and deep pockets such as Intel's 3D-Xpoint;
- Competition from sovereign bottomless deep-pocketed financing ,such as China, entering the NAND market, and technology, IP and market share shifts;
- Declining PC market which is still 60% of the HDD unit market;
- Market acceptance of new product introductions;

- Failure to anticipate and respond to technological and market developments;
- Subject to changes in demand for PC and storage systems;
- Changes in the macroeconomic environments;
- Greater than expected seasonality declines of key products;
- The long and unpredictable sales cycle of enterprise data storage; and
- International operations subject the company to foreign markets and currency fluctuations.

Western Digital Corp

Price Target: We have WDC with a Buy, PT of \$53, 11.9x our F17E EPS of \$4.46. The acquisition of SNDK provides access to in-house NAND, which we believe is a significant advantage over competitor STX.

Risks: WDC competes in a cyclical, technologically intensive industry and sells to a concentrated customer base. Its ability to meet its own or our financial expectations and achieve future growth is subject to a number of risk factors, including, but are not limited to, the following:

- Competition from Samsung with a 2-year 3D-NAND manufacturing lead;
- Competition from new technologies and deep pockets such as Intel's 3D-Xpoint;
- Exposure to NAND volatility and more capex and technology required with in-house NAND technology and IP;
- Declining PC market which is over 60% of the HDD unit market;
- Market acceptance of new product introductions;
- Failure to anticipate and respond to technological and market developments;
- Subject to changes in demand for PC and storage systems;
- Changes in the macroeconomic environments;
- Greater than expected seasonality declines of key products;
- The long and unpredictable sales cycle of enterprise data storage;
- International operations subject the company to foreign markets; and currency fluctuations.

Companies Mentioned (prices as of 7/26)

International Business Machines Corp. (IBM)
Western Digital Corp (WDC- Buy \$53.74)

Seagate Technology PLC (STX- Neutral \$32.45)

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- Underperform:** Stocks for which the anticipated share price falls by 10% or more.
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(As of 7/26)	% of coverage	IB service past 12 mo
Buy (Buy)	45.41%	37.23%
Hold (Neutral)	52.66%	25.69%
Sell (Underperform)	1.93%	25.00%

For disclosure purposes only (NYSE and FINRA ratings distribution requirements), our Buy, Neutral and Underperform ratings are displayed as Buy, Hold and Sell, respectively.

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