



# The Flash-Transformed Financial Data Center

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# Forward-Looking Statements

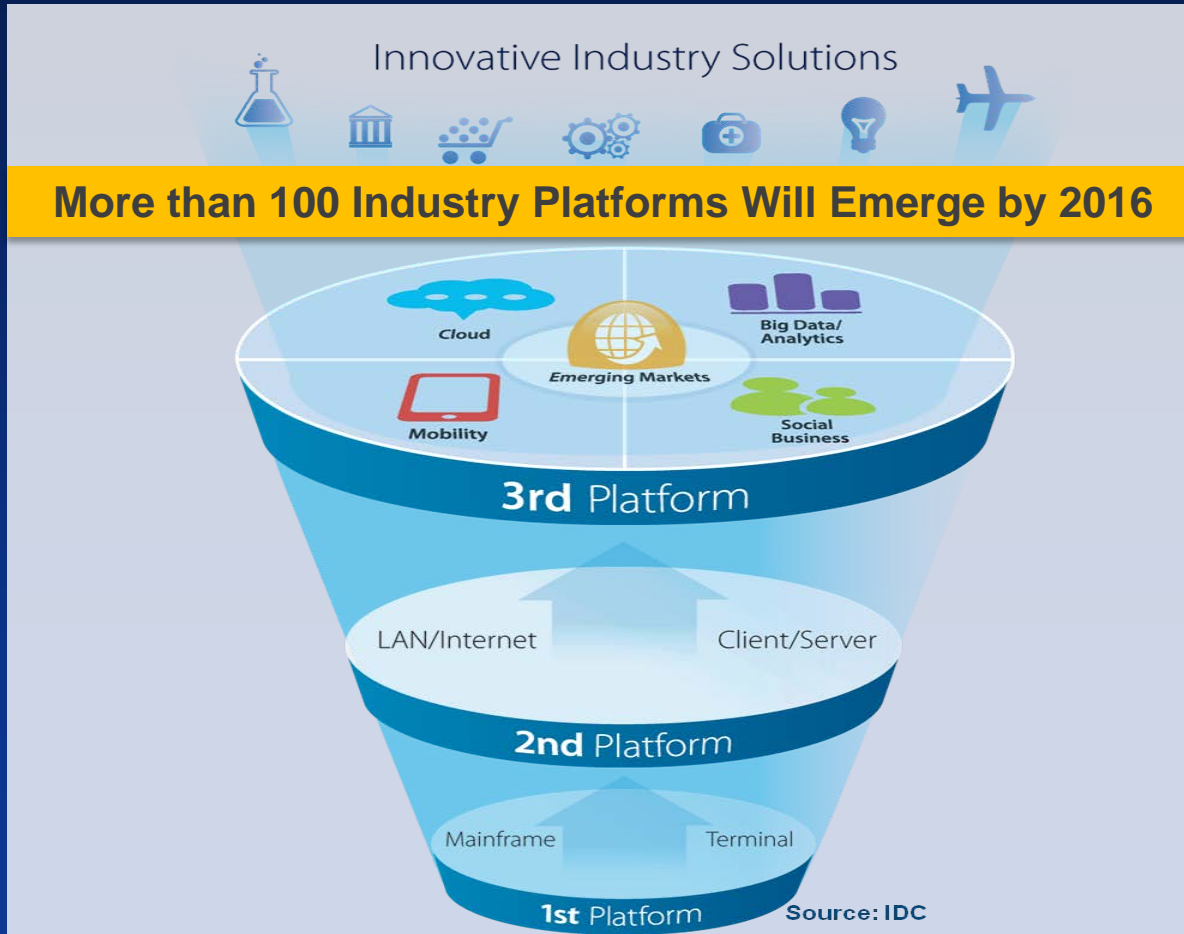
During our meeting today we will make forward-looking statements.

Any statement that refers to expectations, projections or other characterizations of future events or circumstances is a forward-looking statement, including those relating to market growth, industry trends, future memory technology, and future products. This presentation also contains forward-looking statements attributed to third parties, which reflect their projections as of the date of issuance.

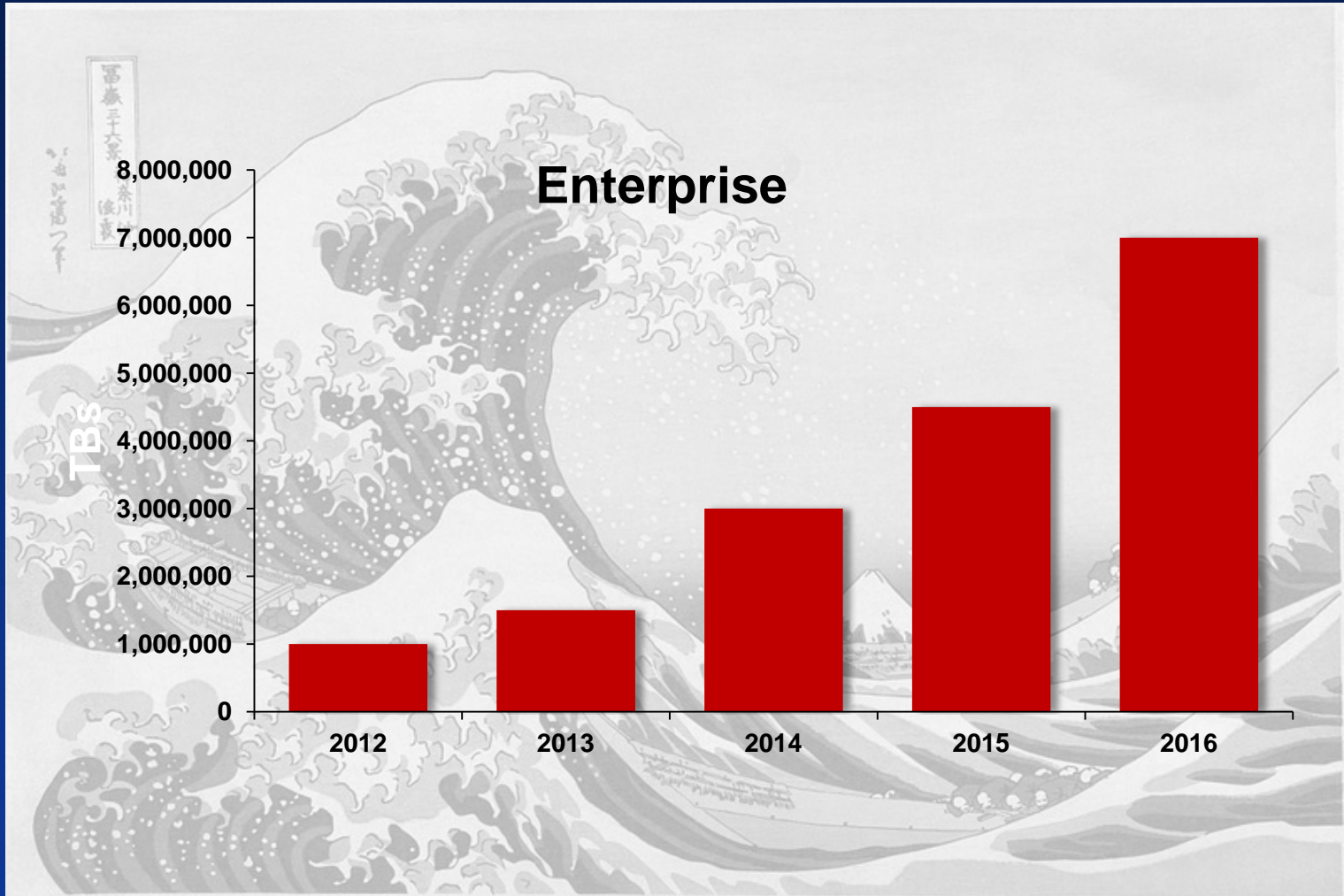
Actual results may differ materially from those expressed in these forward-looking statements due to a number of risks and uncertainties, including the factors detailed under the caption “Risk Factors” and elsewhere in the documents we file from time to time with the SEC, including our annual and quarterly reports.

We undertake no obligation to update these forward-looking statements, which speak only as of the date hereof or as of the date of issuance by a third party, as the case may be.

# The Third Platform Changes Everything – IDC



# Worldwide Enterprise SSD Terabyte Forecast





# Forces Challenging the Financial Services Data Center

## Private & Public Cloud

- Instant resource provisioning is the new expectation

## Virtualization

- Performance challenge for shared storage infrastructure

## Service Delivery

- Instant access
- Memory-like speed performance

## In-Memory Computing

- Near real-time results needed by business
- Large data sets

## Infrastructure

- Need reduction in server and storage systems, power, cooling, and floor space

## New Math: \$/GB Replaced by TCA & TCO

- Total Cost of Acquisition (TCA) = drives + enclosures + power supplies + ...



# Top Priorities for Financial Services

- Improving speed and application performance
- Supporting timely business decisions
- Ensuring data integrity – and data security
- Reducing distance to network switches
- Competing via Big Data/Analytics
- Investing to speed time-to-results
- Evaluating technology refresh – all the time

# Flash Benefits that Improve Financial Workloads Performance

## Financial Services



- Block device
- Low, predictable latency
- Fast Interactive Data Analysis

## Database/Cloud



- Block device/ memory extension
- Increase Transactions per Second
- Memcached consolidation

## Virtualization



- Block device
- Increased VMs per Node
- Faster response times per VM

## Blade Server



- Block device
- Utilizes empty DIMM slots
- Enables high density storage blades

## In Memory Compute



- Memory extension
- Reduce response times for analytics queries



# How Does Flash Storage Change Financial Services Deployments?

- Runs databases and analytics faster
- Gets results from Hadoop clusters faster
- Supports web-scale architectures
- Reduces data center footprints
- Supports consolidation of workloads
- Reduces operational costs – space, power and cooling

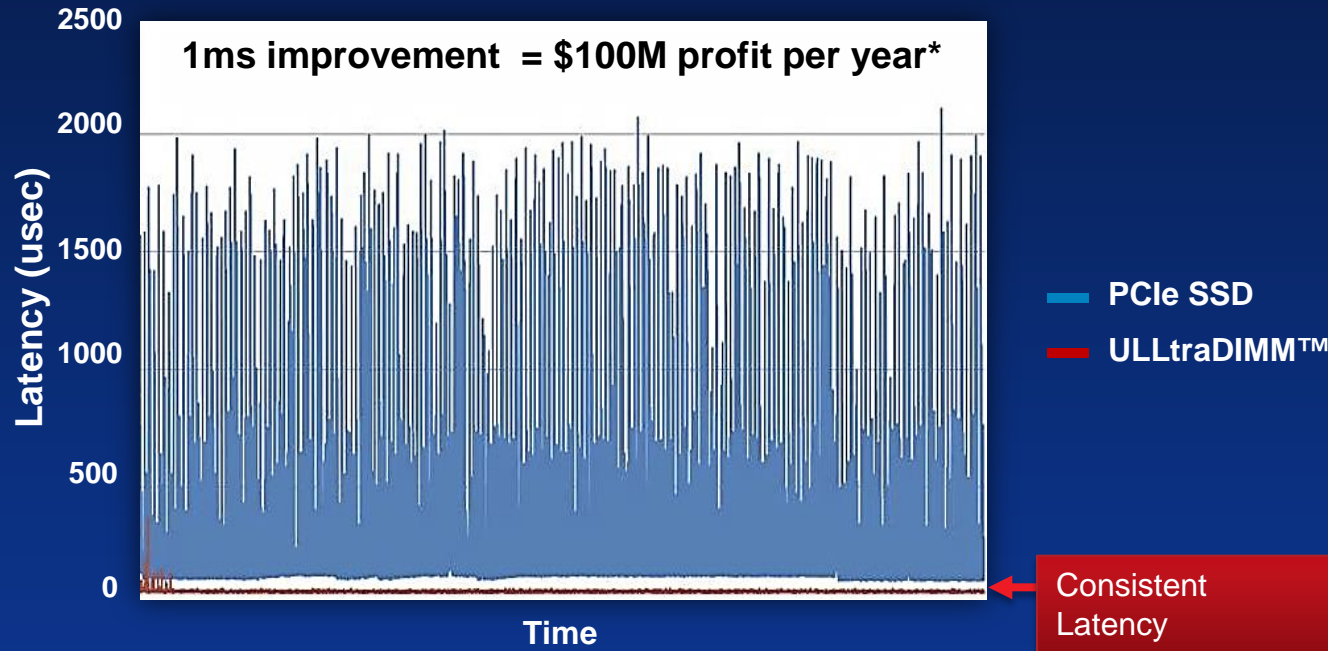


# Changing Perceptions about SSDs

- Cost to acquire in \$/GB
  - It's not the only metric (\$/IOPS; IOPS/watt)
- Total costs for deployment
  - Looks at total servers/storage deployed
  - Impact on IT operations
- Reliability of hardware
  - HW/SW approaches to long product life
  - Product guarantees up to 5 years

# High Frequency Trading

*Metric: Response Time*



**Low Latency, Predictable Performance will win the trade**

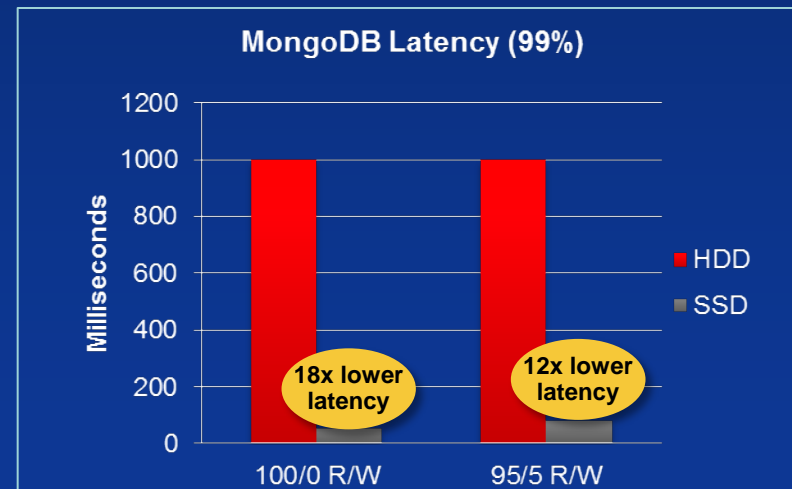
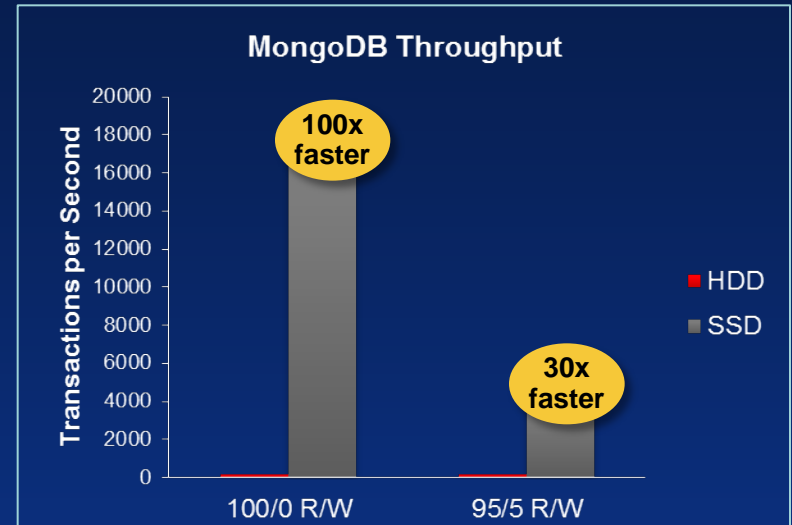


Santa Clara, CA  
August 2014

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# MongoDB

- Fast query performance for large amounts of unstructured data
- Data set needs to fit in DRAM for optimal performance
- SSDs extend MongoDB's optimal performance for data sets greater than DRAM
- Opportunity for better TCO with fewer servers storing more data





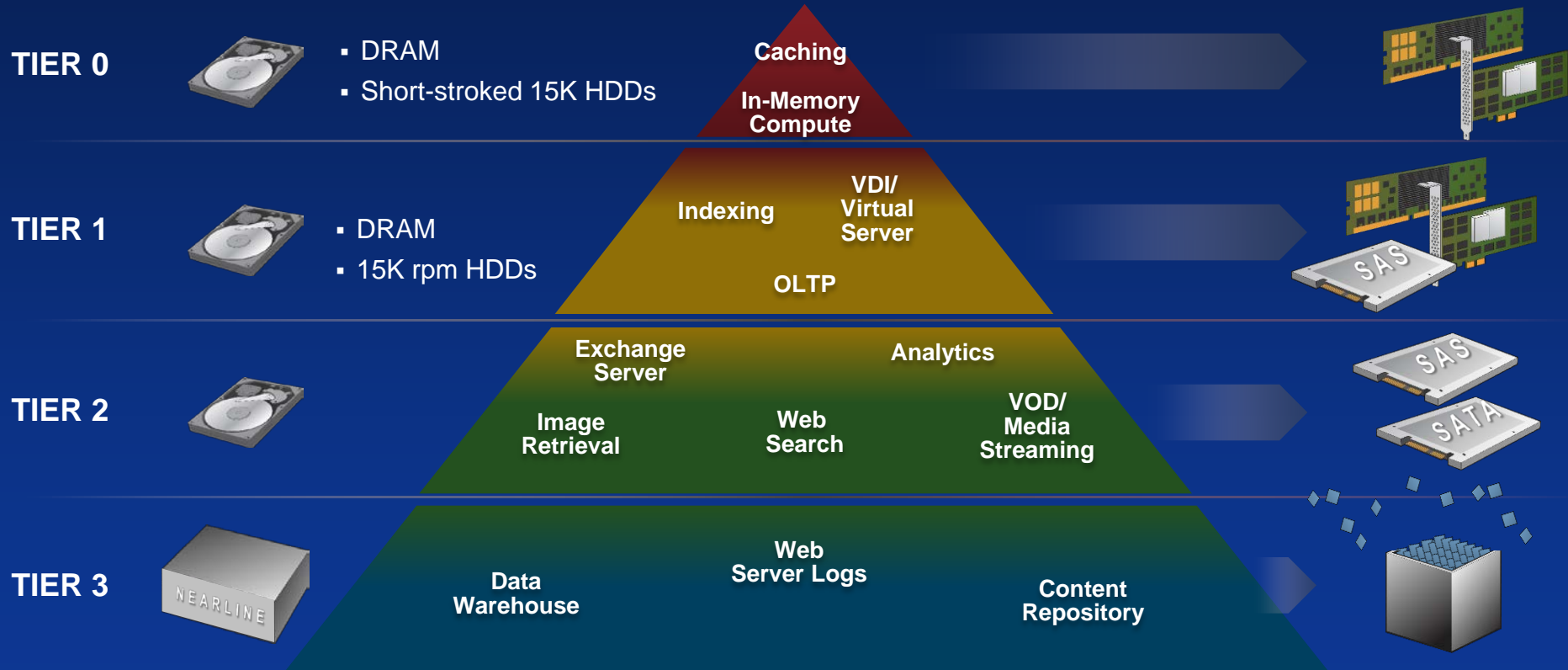
# In-Memory Computing (IMC)

- In-memory computing (IMC) accelerates the analysis of big data-sets
- Large data-sets must “fit” Inside DRAM – but SSDs extend the capacity to multi-terabytes (TB)
- New software approaches to develop financial Apps for IMC data analysis
- New Hardware + Software Tools Support IMC
- IMC is a rapidly growing segment for Big Data and financial services workloads

# Flash Transforms Applications Across the Tiers of the Data Center

Legacy Storage

Leading Edge Storage





# Summary: Financial Services Data Centers

- Business results are the key to IT decisions
- Big Data requires faster DB processing
  - Structured data + unstructured data
  - New data types require higher bandwidth, IOPS
  - Media-centric data (video, images)
- Rising business unit expectations about timeliness (milliseconds to microseconds)
- Putting it all together takes planning, policies
  - and technology refresh





# Thank You!

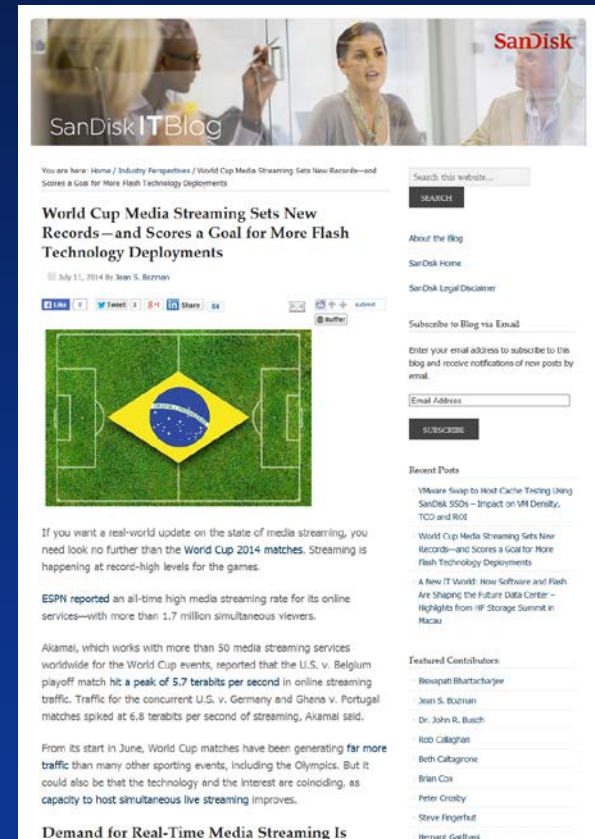
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The screenshot shows a blog post from SanDisk IT Blog. The article title is "World Cup Media Streaming Sets New Records—and Scores a Goal for More Flash Technology Deployments" by Jean S. Bozman, dated July 11, 2014. The main image is a soccer field with the Brazilian flag in the center. The article text discusses media streaming records during the World Cup, mentioning Akamai and ESPN. A sidebar on the right includes a search bar, "About the Blog", "SanDisk Home", "SanDisk Legal Disclaimer", an email subscription form, "Recent Posts", and a "Featured Contributors" list.