



Hewlett Packard
Enterprise

Big Data Conference 2016

#SeizeTheData



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Big Data on HPE Vertica driving best-in-class support at Nimble Storage

August 30th, 2016



Introduction to Nimble Storage



The chief problem of our product space: the app-data gap



What is InfoSight?



How does InfoSight benefit us and our customers?



Deep dive on our analytics



Deep dive on our infrastructure

Introduction to Nimble Storage

The Leader in Predictive Flash Storage



Highest Net Promoter Score in storage industry



Publicly traded since December 2013



Leader Gartner Magic Quadrant



82% CAGR FY13–FY16



8,000+ customers



50+ countries

Technology Alliances





Sheer Performance and Scalability



- 1.2 million IOPS
- 8PB+
- <1ms latency

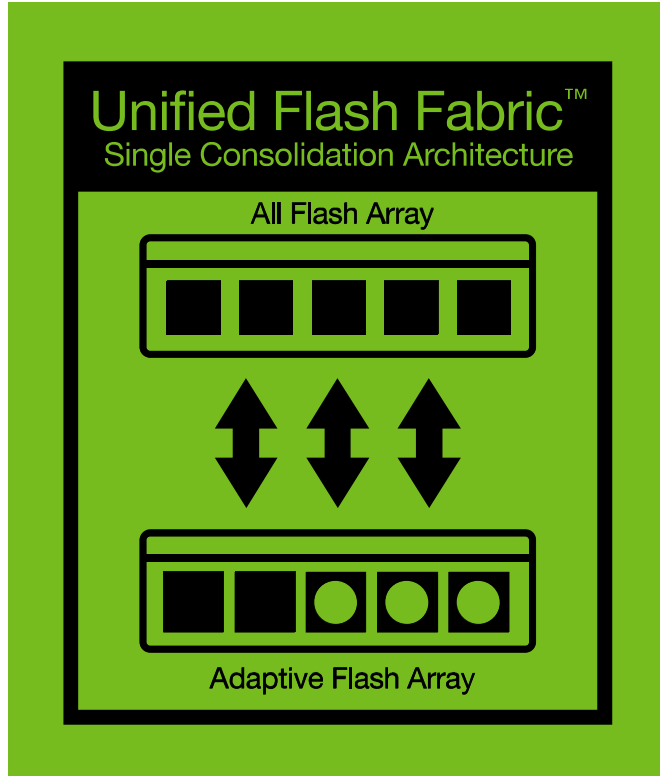
33%-66% less TCO



- 5X lower footprint

Absolute Resiliency





All Flash: 100% Flash

Absolute speed for performance sensitive apps



Adaptive Flash: Up to 100% Flash

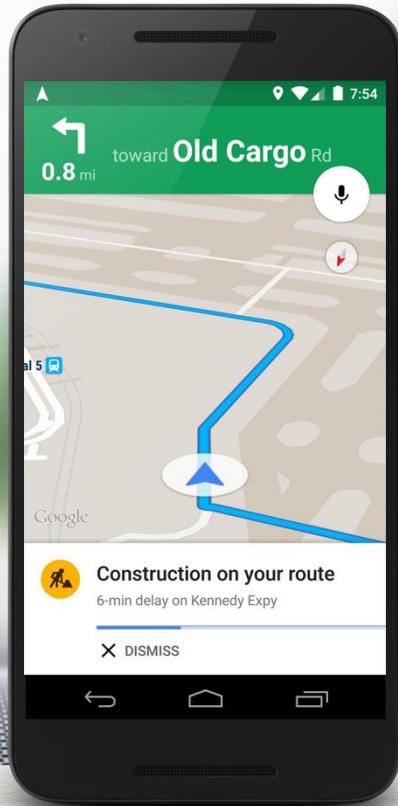
Optimized price and performance for mixed mainstream apps

Common
Data
Services

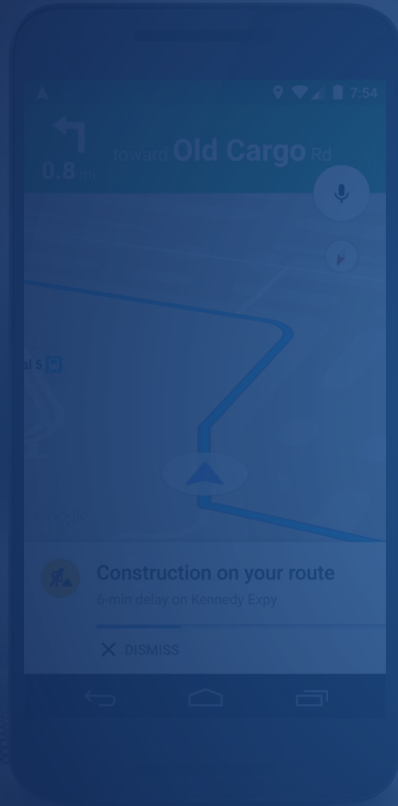
The chief problem in our product space

The App-Data Gap

We Expect Data to be Available...Instantly



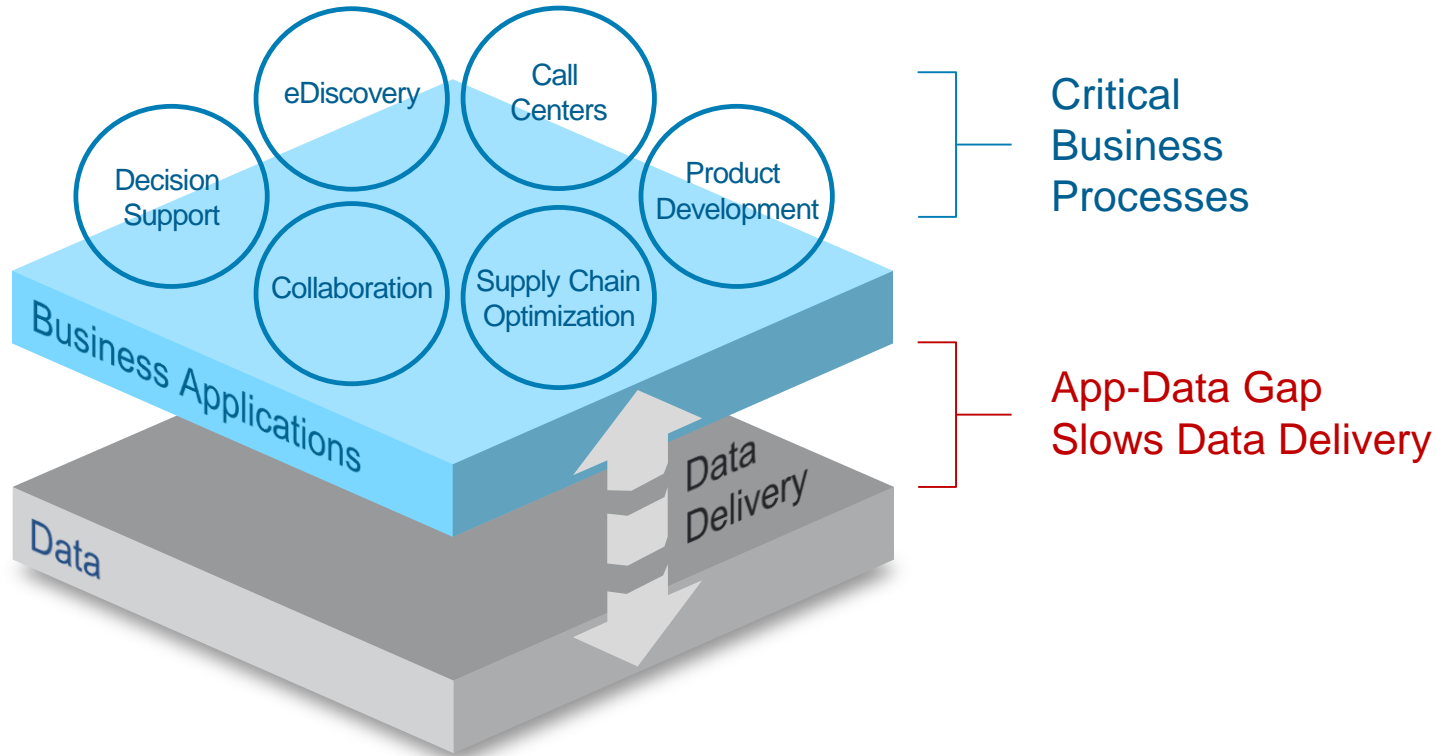
Data Disruption Slows Down Progress

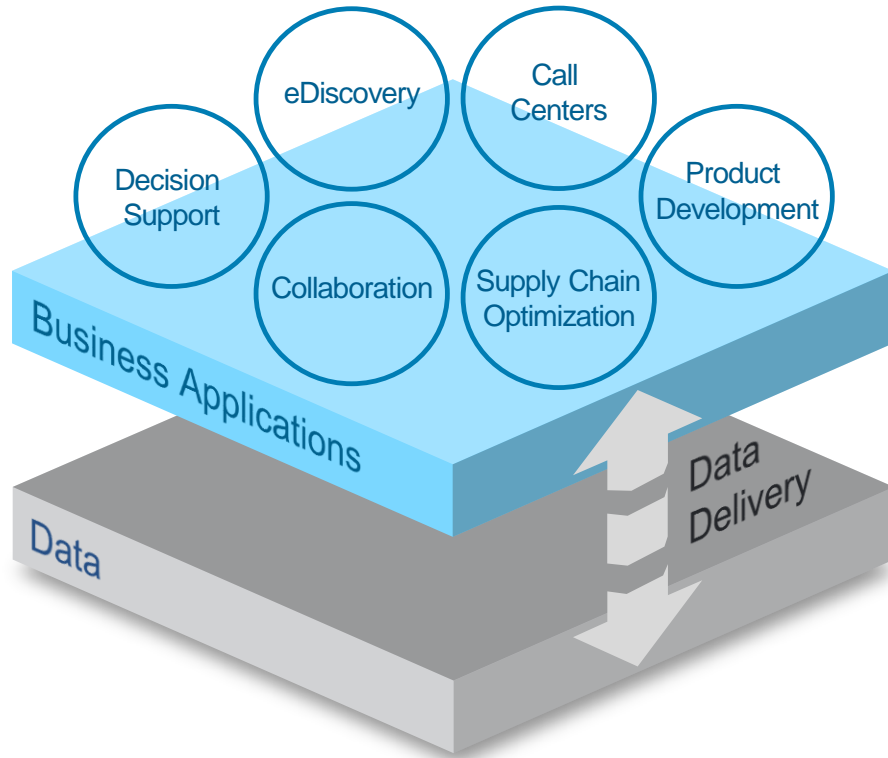


LOADING...

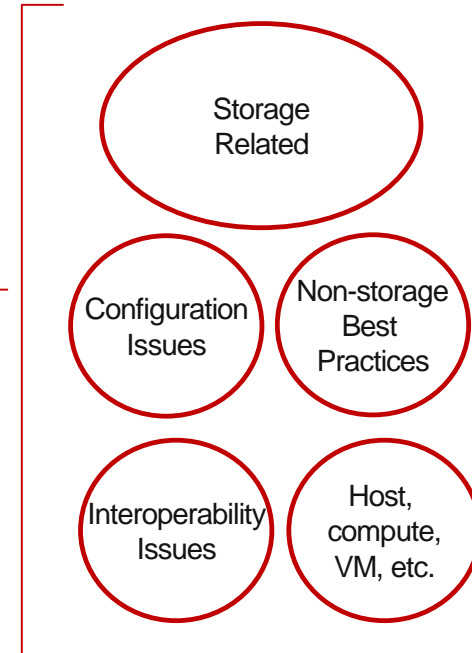


App-Data Gap Slows Critical Business Processes









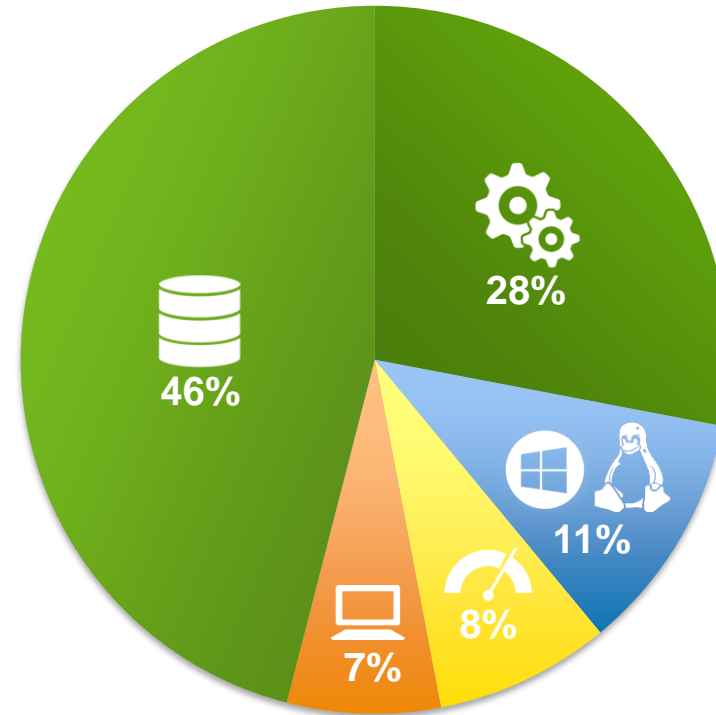
Causes of App-Data Gap*

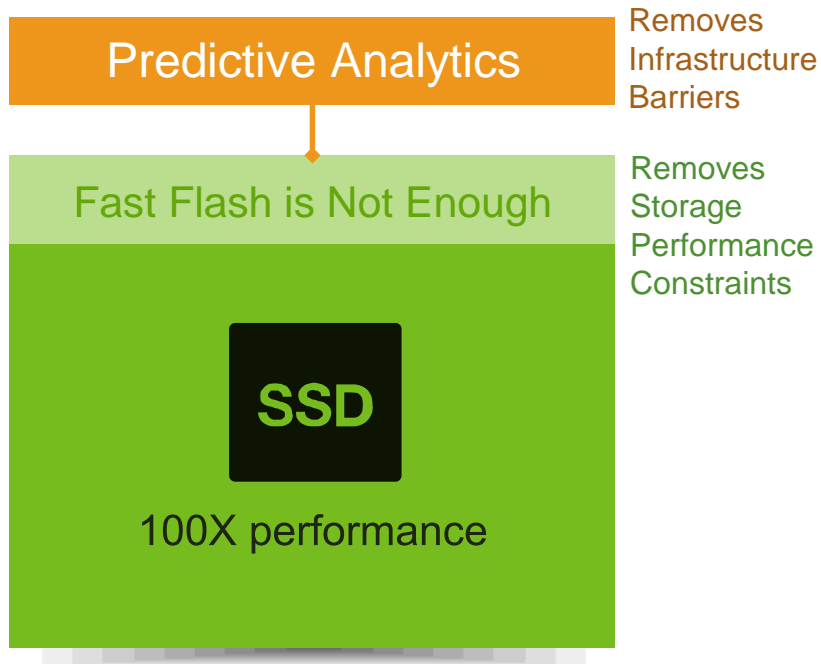


*Source: InfoSight analysis across more than 7,500 customers

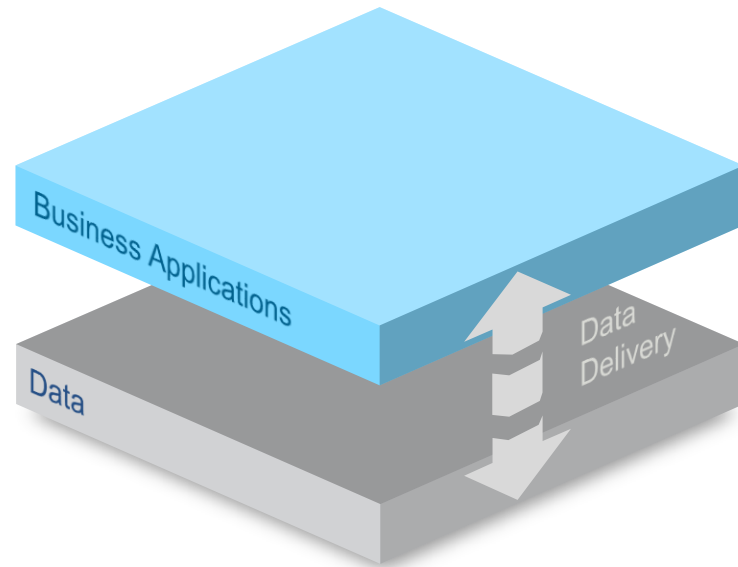
Top problems contributing to the App-Data Gap

-  **1** Storage Related
-  **2** Configuration Issues
-  **3** Interoperability Issues
-  **4** Not storage best practices impacting performance
-  **5** Host, compute, VM



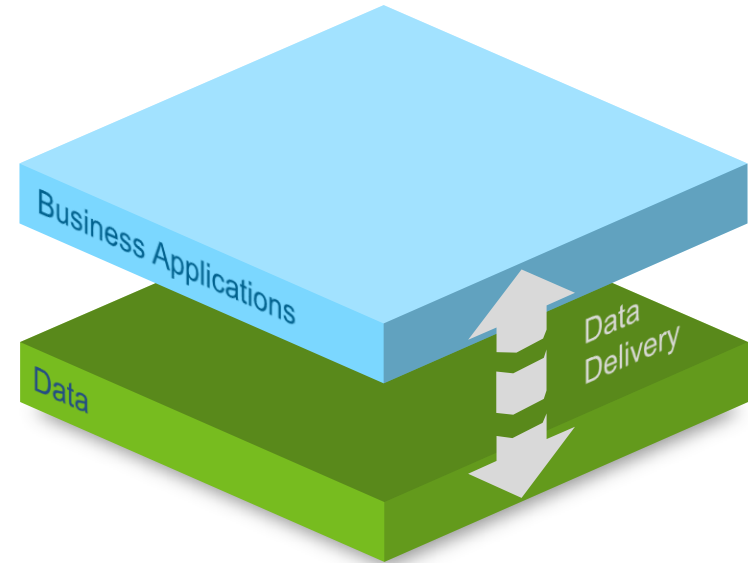


Closing the App-Data Gap



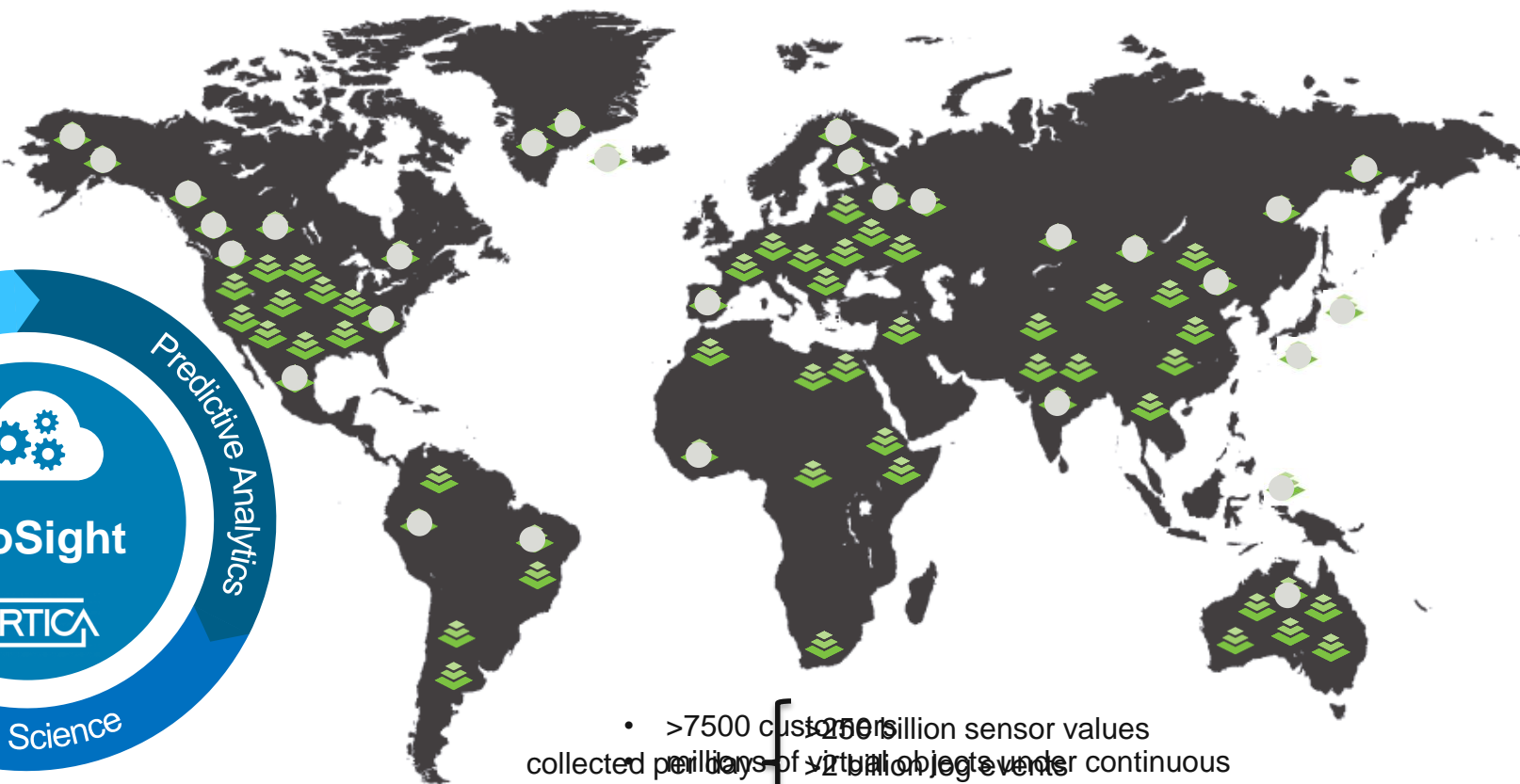
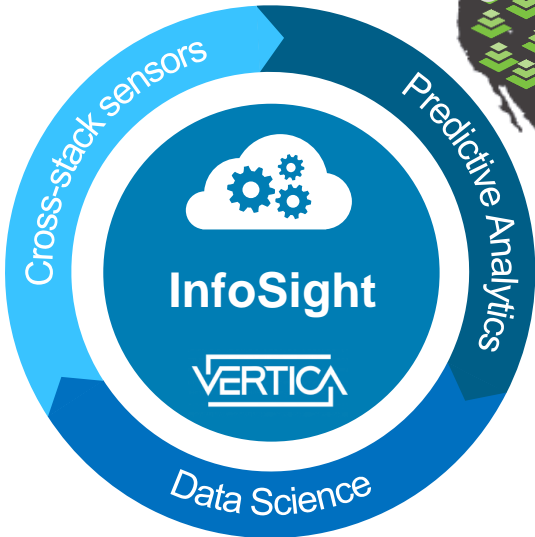


Closing the App-Data Gap



What is InfoSight?

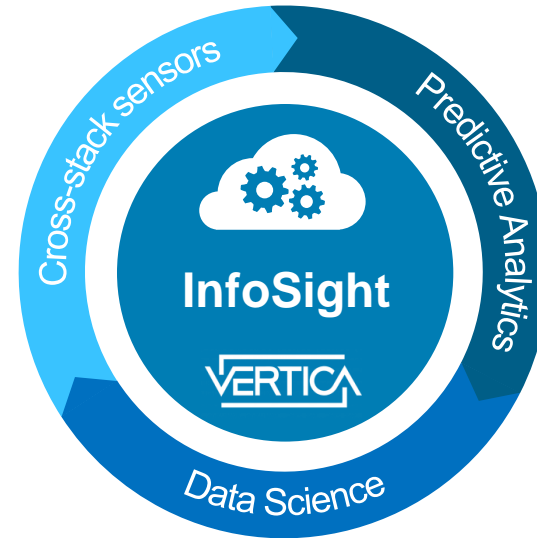
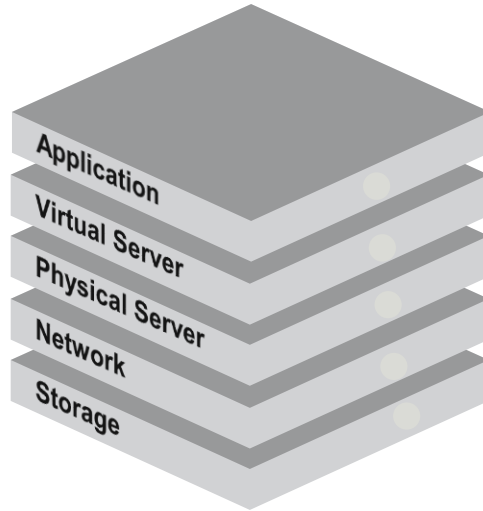
The Internet of (Powerful) Things



- >7500 customers
- >250 billion sensor values collected per day
- >2 billion objects under continuous monitoring
- >100 million configuration variables

InfoSight collects and analyzes more
sensor data points every four hours,

than there are stars in our galaxy.

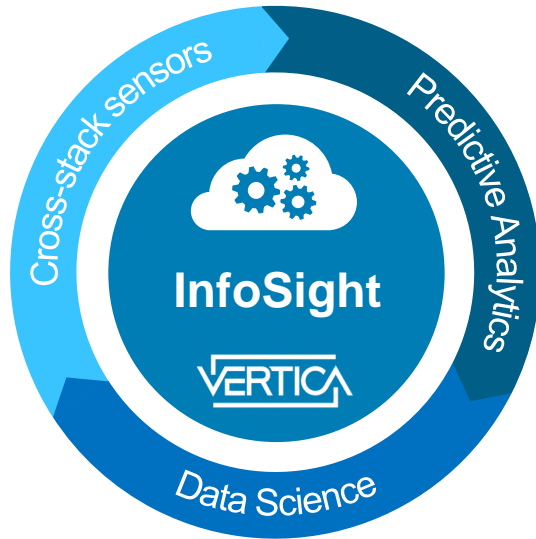


many dimensions of reporting

- Virtual Machine
- Host Server
- Virtual Disk
- Datastore
- Nimble Volume
- Nimble Storage Pool

A blue-tinted landscape featuring a winding road that curves through a valley. A small car is visible on the road in the lower right. The background shows rolling hills and a river or stream winding through the valley.

How do we make this telemetry actionable?



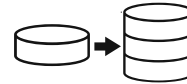
Rapidly develop and deploy elaborate problem signatures (e.g. using sensors, log & config. data)



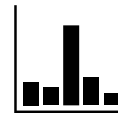
Investigate opportunities for Nimble OS optimization



Automate performance diagnostics through correlation analysis



Perform personalized resource needs analysis and consumption forecasting

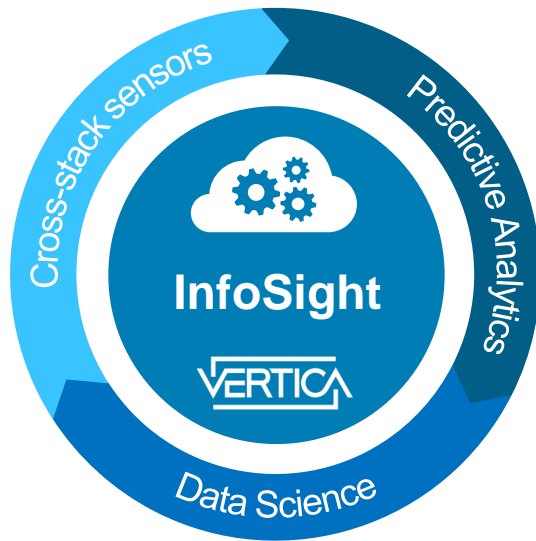


Display tailored visualizations to give customers cross-stack visibility

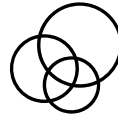


Characterize applications to map their resource needs to specific hardware

What are the benefits of InfoSight?



>90% of support cases opened by automation
>80% of solutions provided automatically



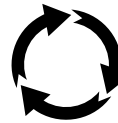
Difficult-to-diagnose issues that span the IT stack can be efficiently root-caused



InfoSight both drives and quantifies our high availability



<1 minute hold time to level 3 support engineers with 12 years industry experience on average



45 minute average case resolution time

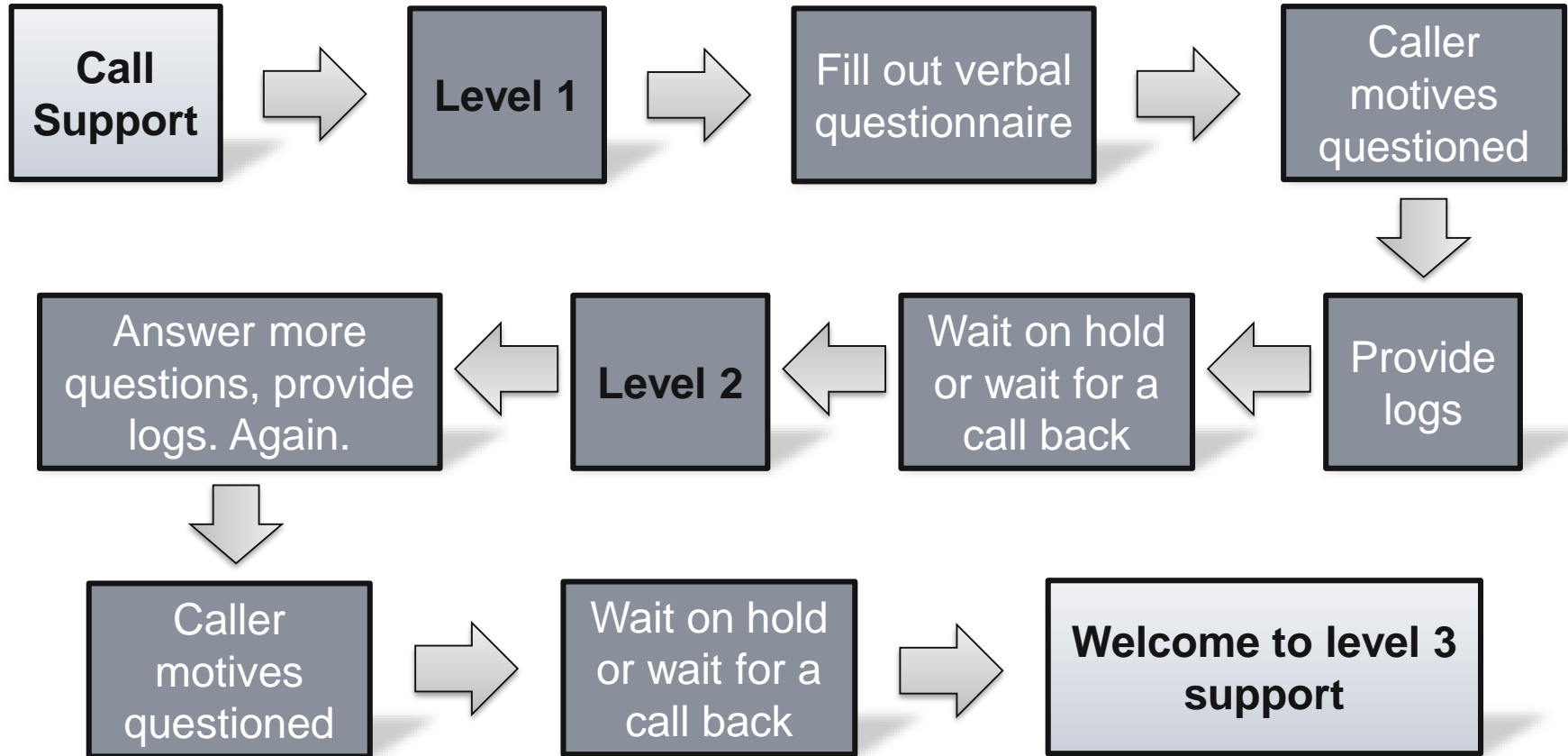


4.9/5 average score on customer satisfaction surveys for support

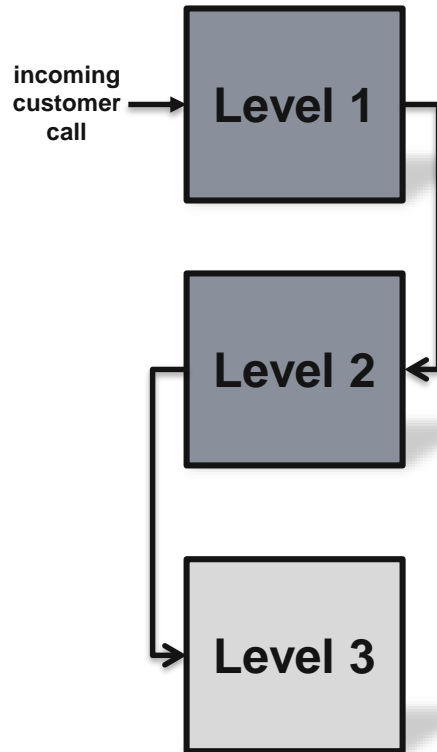


An exceptional net promoter score showing excellent customer loyalty

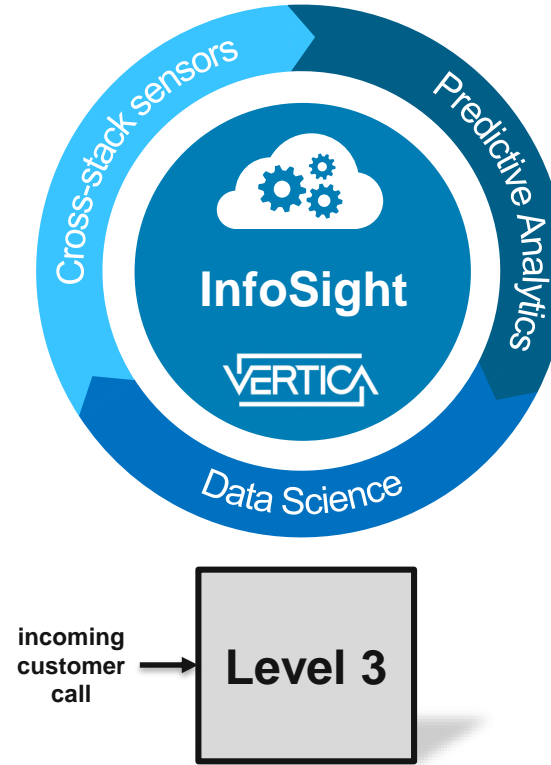
How to get level 3 support – the traditional method



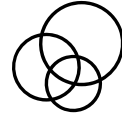
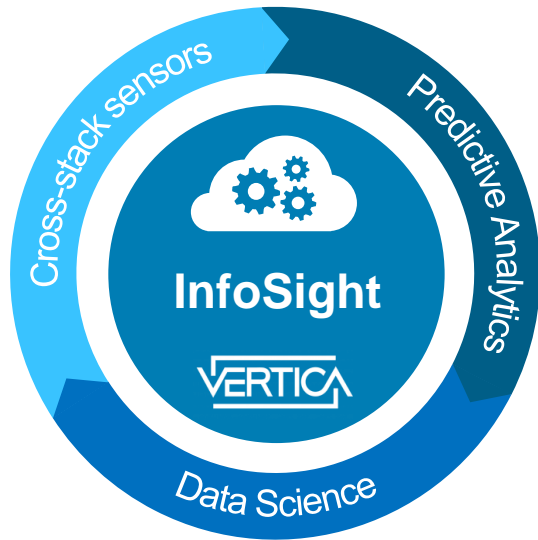
Classic Support Experience



Nimble's Support Experience



InfoSight Analytics Deep Dive



Difficult-to-diagnose issues that span the IT stack can be root-caused by writing a few queries



Rapidly develop and deploy elaborate problem signatures (e.g. using sensors, log & config. data)



Investigate opportunities for Nimble OS optimization



Perform personalized resource needs analysis and consumption forecasting



Display tailored visualizations to give customers cross-stack visibility



Automate performance diagnostics through correlation analysis



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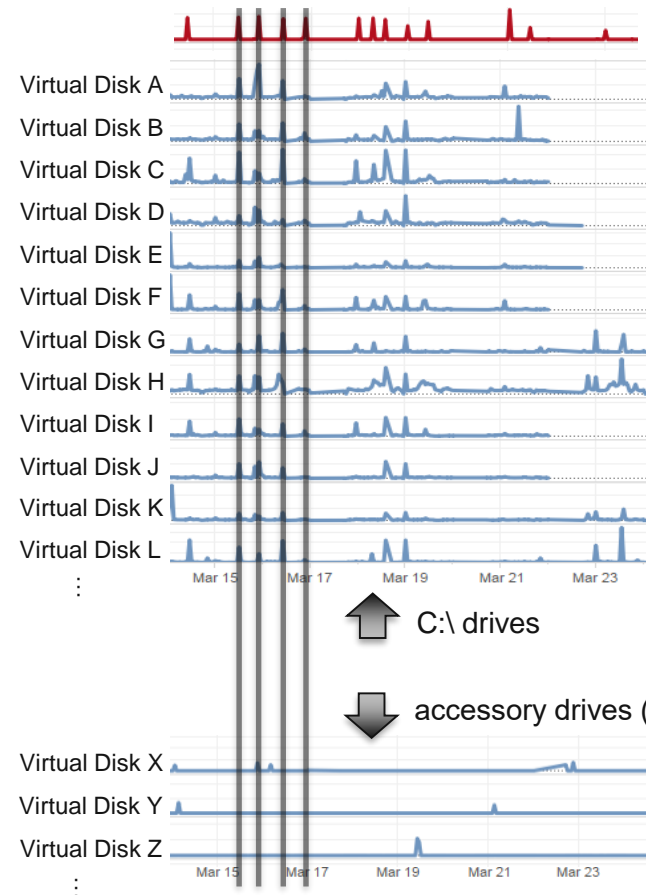
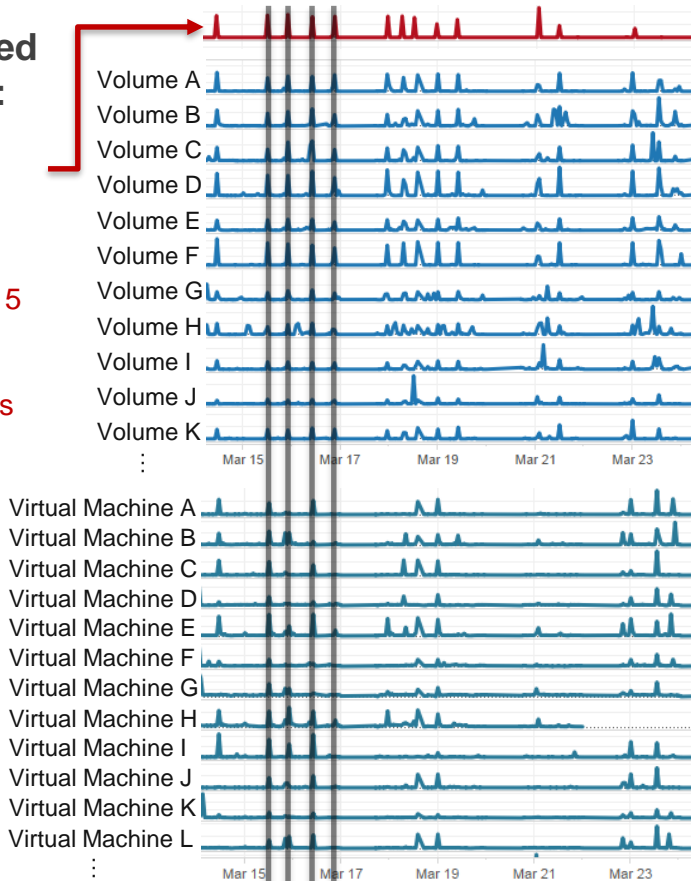
Cross-Stack Root Cause Analysis

Example Solved Support Case:

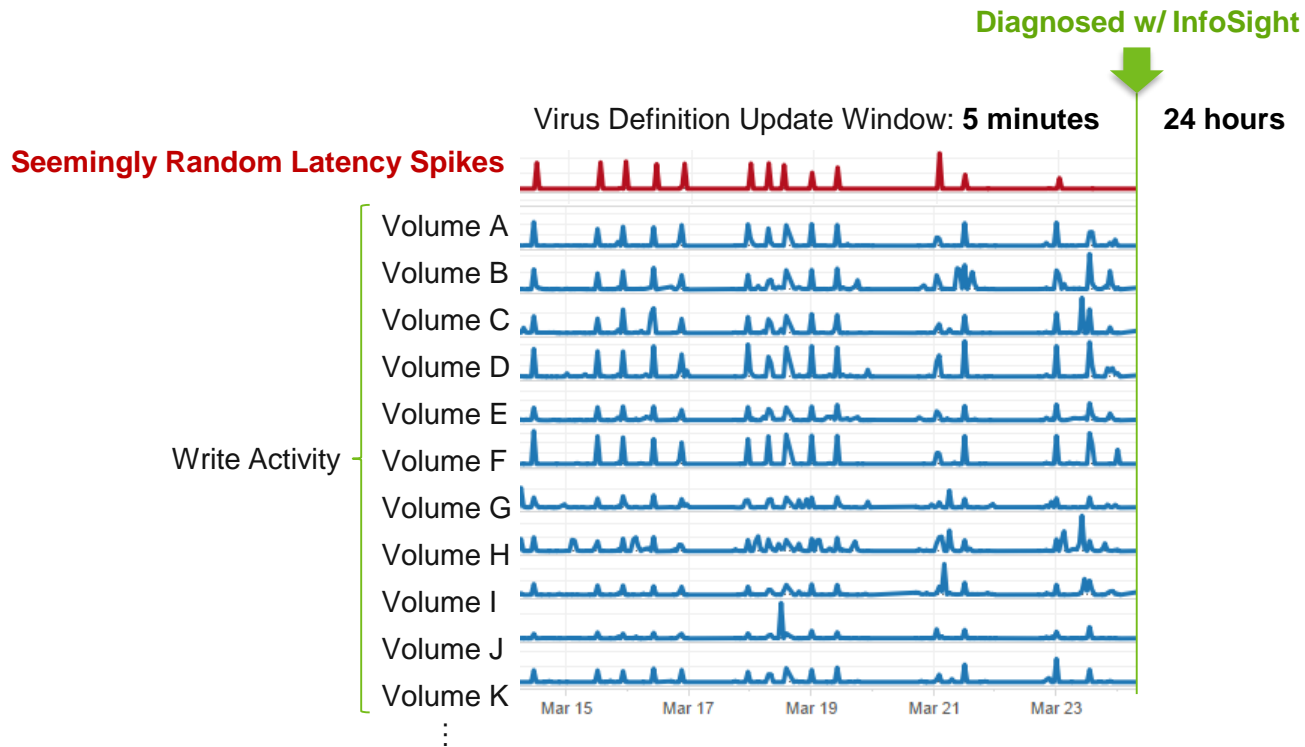
Seemingly Random Latency Spikes

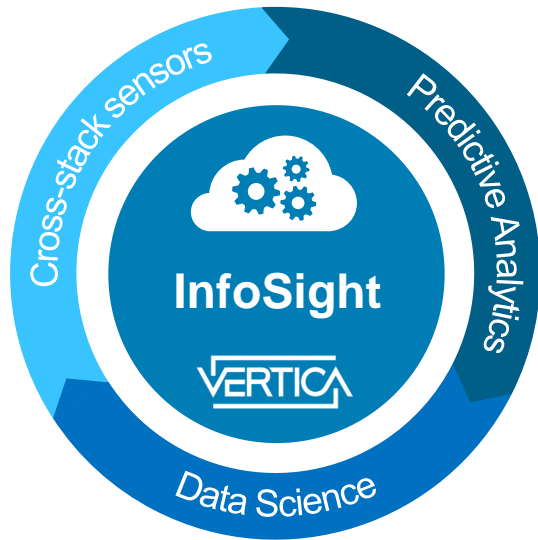
- Between 1 and 5 times daily
- About 5 minutes in duration

Our queries indicated that most Volumes, Virtual Machines and Virtual Disks participated.



Amongst the Virtual Disks, however, the C:\ drives on the windows machines were affected while accessory disks were not...





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Characterize applications to map their resource needs to specific hardware

Issue | Eliminating the App Data Gap and driving high availability

Impact

If we know of an issue you should not be susceptible

Solution

Dynamic Update Paths govern optimal software update path for your environment and workloads

Result

1,000's of arrays with optimized update paths

If you see it, click it!
2-button-click

53% update during business hours

>99.9997% Availability



Issue

Hypervisor abruptly took volumes offline during array update

Impact

Hypervisor bug would knock **volumes offline** during Nimble OS update

Solution

Array's linked to hypervisors with the affected build's were **blacklisted from updating** the array OS. The hypervisor vendor was notified.

Result

Application downtime prevented by requiring the hypervisor fix be applied before update.



Issue

ESX initiator issue where incorrect response to SCSI command caused excessive write request amplification.

Impact

10x lower throughput, higher latency. System unusable

Solution

Mitigated risk by **Blacklisting 600 systems** that would otherwise hit Performance degradation

Result

2PB data delivered at Nimble Data Velocity that could otherwise have taken 10x longer



Issue

Open ports on the Internet will undergo brute force attacks within minutes.

Impact

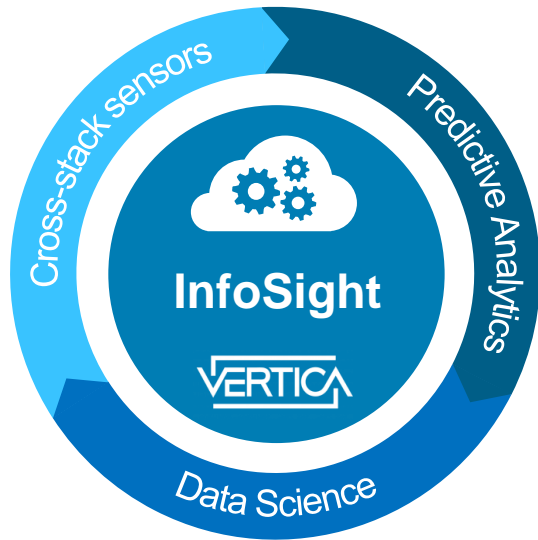
Malicious cyber attack,
DOS, Data theft
(IP, Personal data, etc.)

Solution

Ethical hacking
techniques
proactively employed
to identify at-risk
systems immediately

Result

400TB data at-risk of
brute force attack at
100 customers **now
protected**



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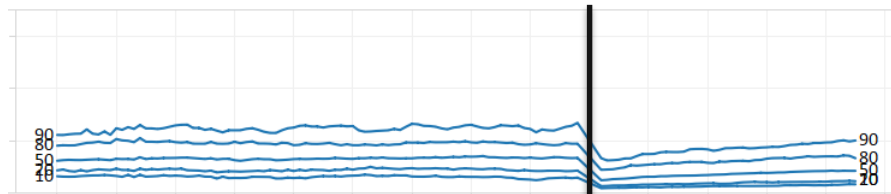
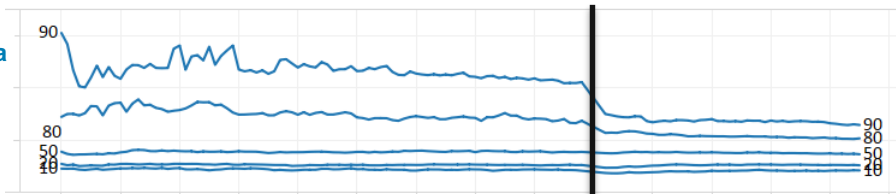
Characterize applications to map their resource needs to specific hardware

Monitoring Release Rollouts

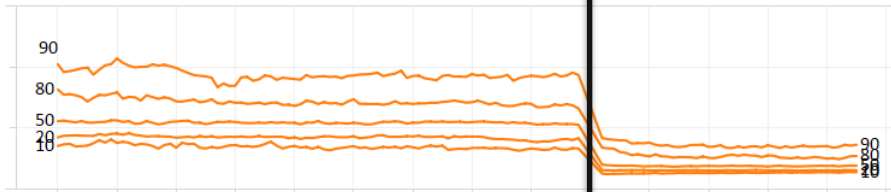
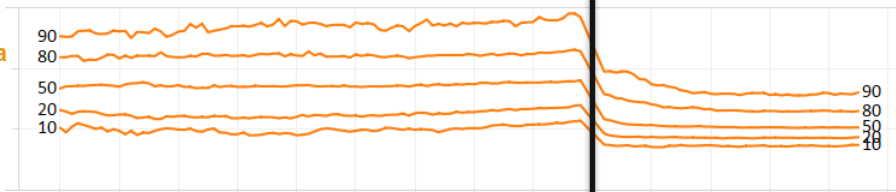
Nimble OS: Upgrade to 2.2.x

Upgrade 2.2.x to 2.3.x

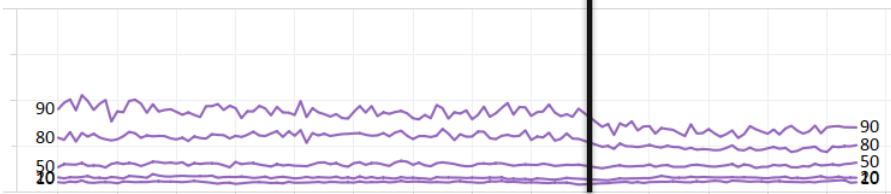
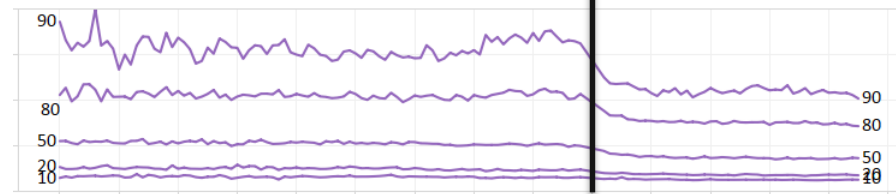
SSD
Metadata
'A'

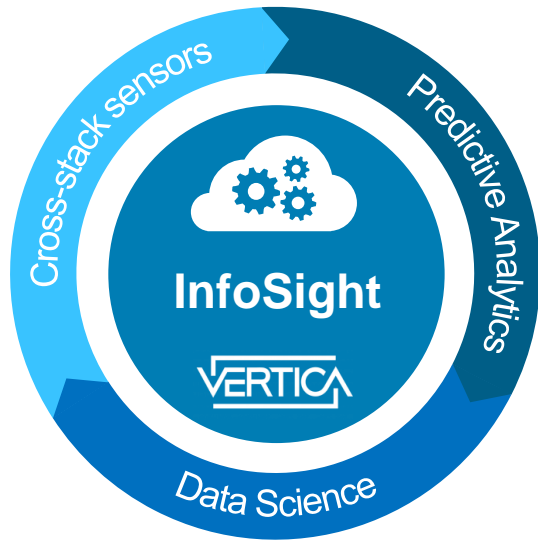


SSD
Metadata
'B'



Read
Latency





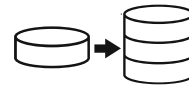
Difficult-to-diagnose issues that span the IT stack can be root-caused by writing a few queries



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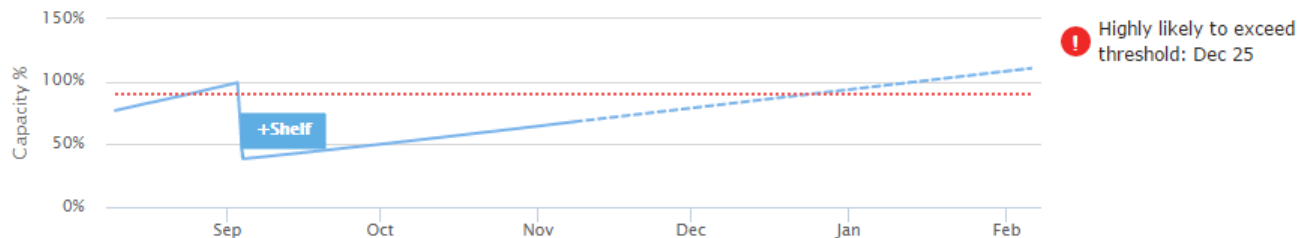
Automate performance diagnostics through correlation analysis



Characterize applications to map their resource needs to specific hardware

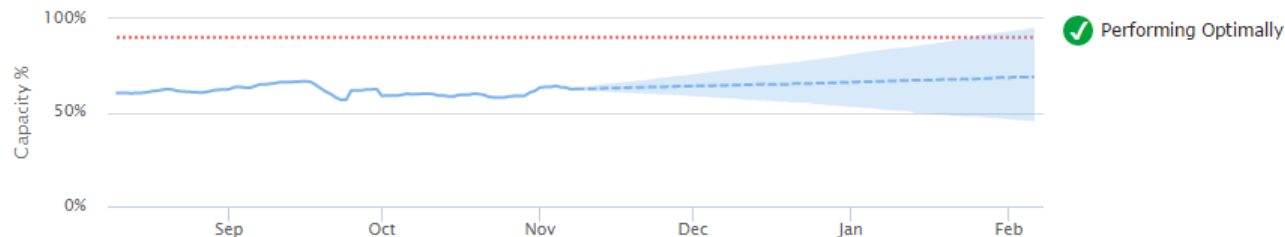
No-Touch Usage Forecasting

supportarray06 | S/N: AF-102304 | Model: CS460G-X2 (+1 shelf) ⓘ | Version: 2.1.8.0-176861-opt | Group: supportarray06 | Pool: default

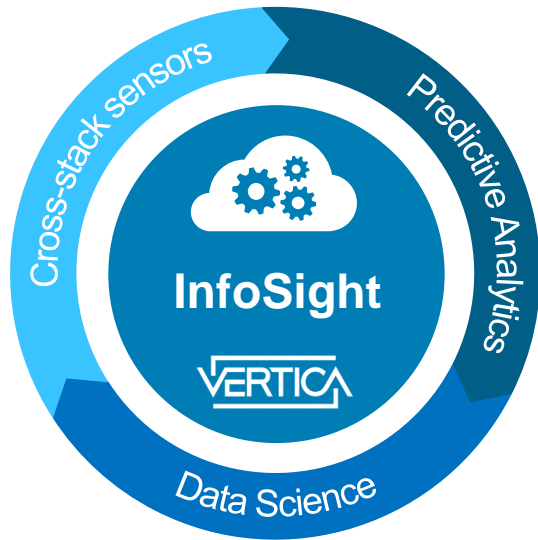


Capacity: 54 TiB | Used: 37 TiB (68.3%)

vertica13-array01 | S/N: AC-103435 | Model: CS460G-X2 | Version: 2.1.8.0-176861-opt | Group: vertica13-array01 | Pool: default



Capacity: 23 TiB | Used: 14 TiB (62.5%)



Difficult-to-diagnose issues that span the IT stack can be root-caused by writing a few queries



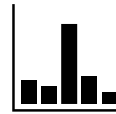
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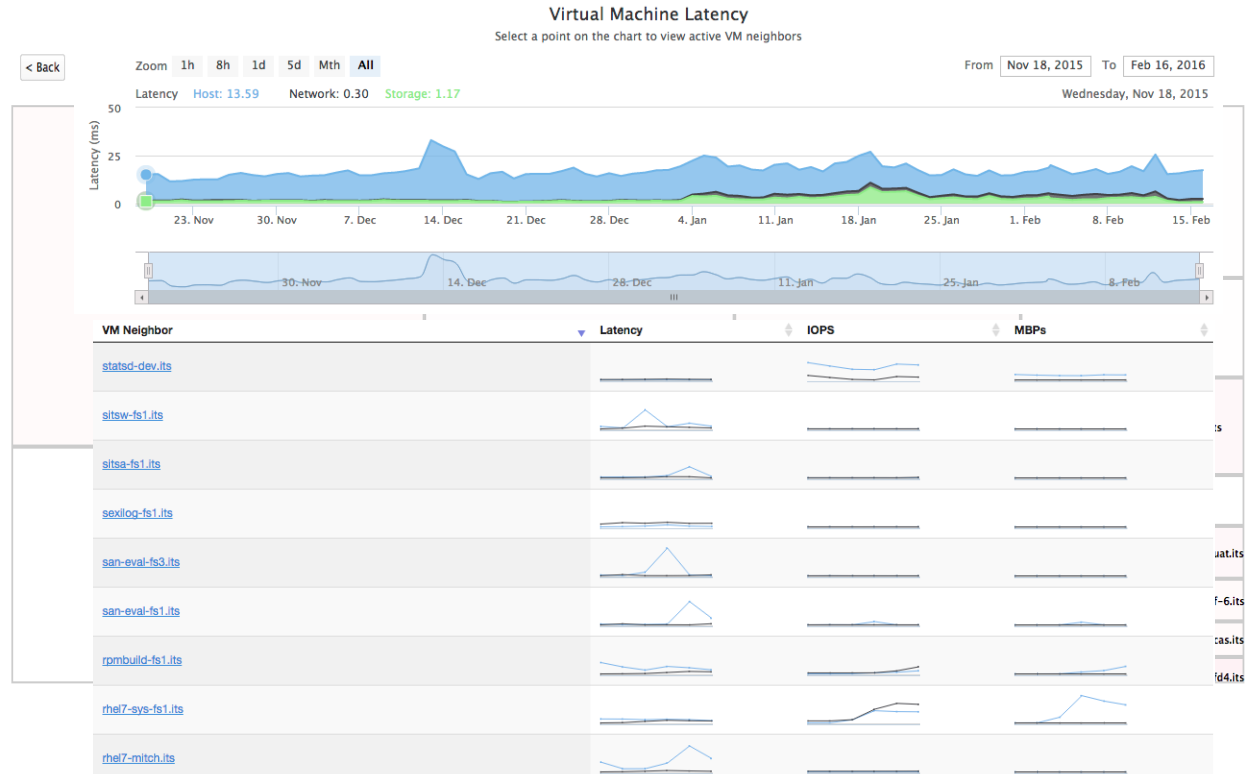
Characterize applications to map their resource needs to specific hardware

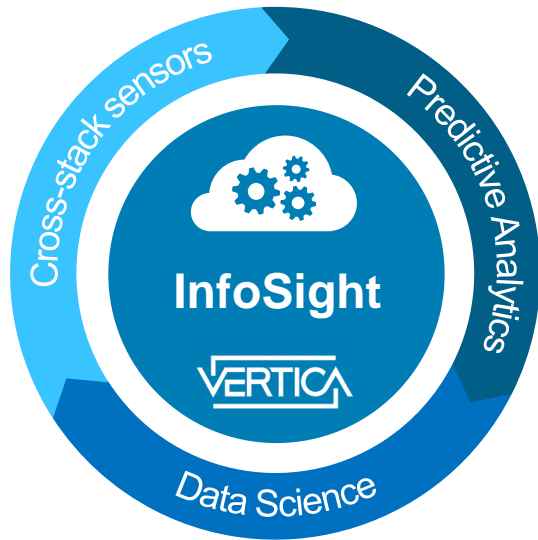
Problem

- Determine when a VM, Virtual Disk or Volume's activity is competing for a shared resource and impeding activity on a neighboring one

Solutions

- Align VCenter data with ours
- Treemap to identify latency by data store
- Time series to show latency/IOPS interactions





Difficult-to-diagnose issues that span the IT stack can be root-caused by writing a few queries



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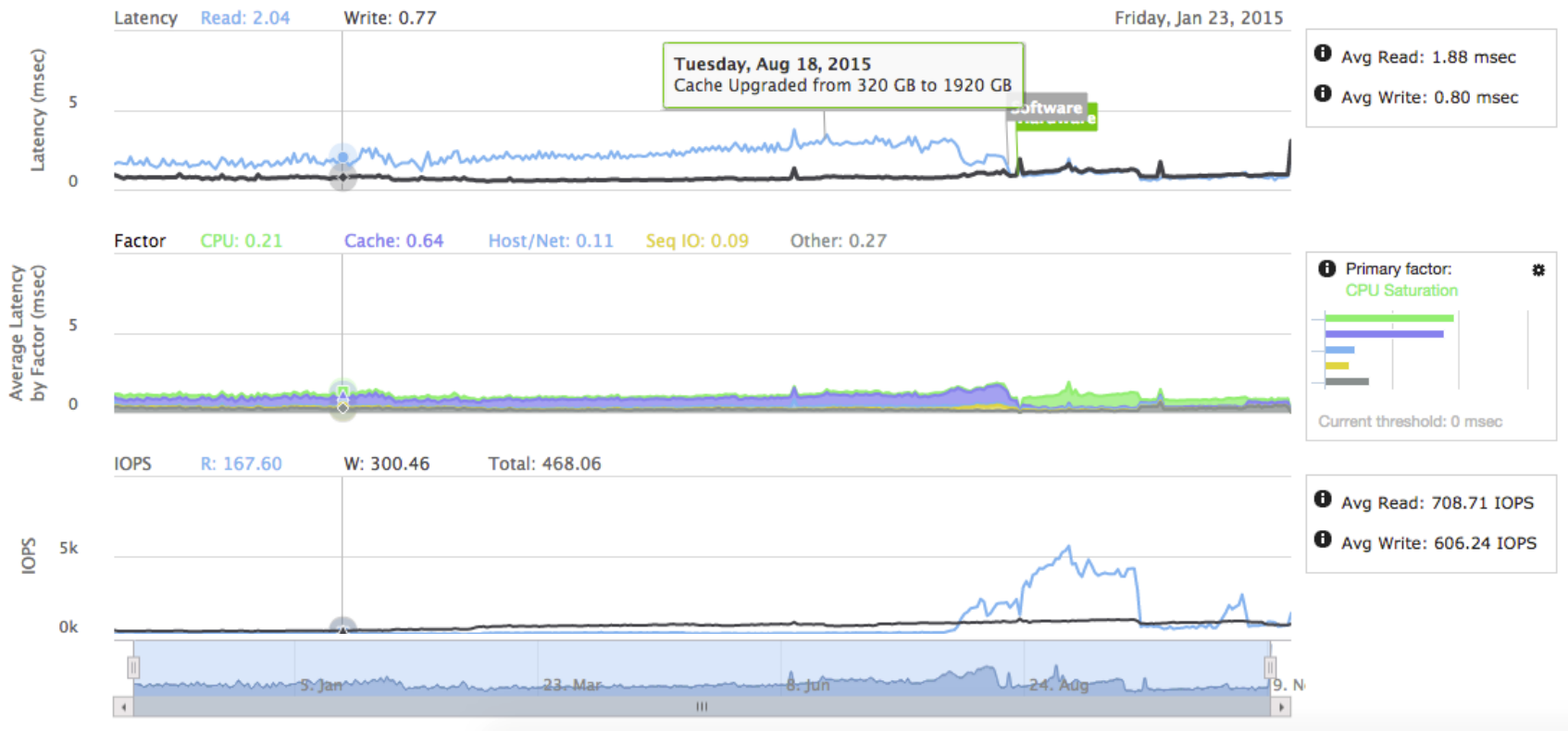


Automate performance diagnostics through correlation analysis



Characterize applications to map their resource needs to specific hardware

Automated Diagnostics & Predictions





Issue

Strange latency behavior

Impact

**Sporadic
high
latency**

System unusable

Solution

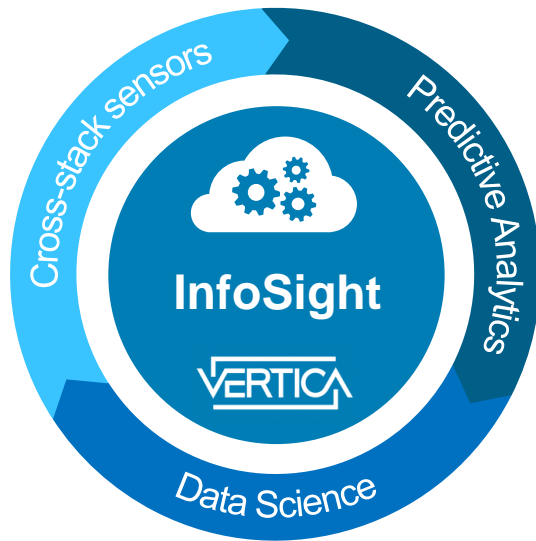
**End-To-End
correlation**

Identified a specific
pattern of network
retransmits due to a bad
server NIC

Result

**NIC was
replaced**

Immediately resolved
issue. Server and
Hypervisor vendors
unable to resolve issue



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Characterize applications to map their resource needs to specific hardware

Example Input:

▼ Applications (1) Exchange

▼ Exchange

Application name: Exchange 1


Size via: Amount of data Number of mailboxes

Number of mailboxes: 500


GB allocated per mailbox: 20


Operating mode: Online Offline

Email archiving: None Archive emails older than days


Promote to "all-flash": 

Total IOPS: 20000

Use measured IO values: 






Application encrypted: 

▼ Snapshot Schedules (1)

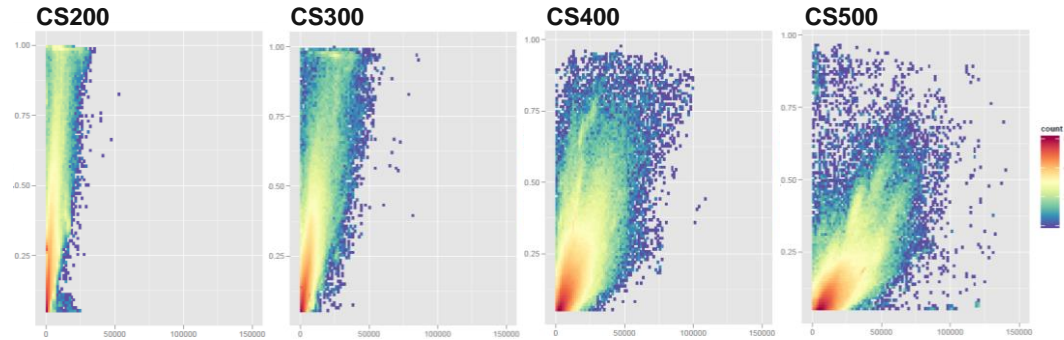
Snapshot frequency: 30 Minutes 

Snapshots retained: 48

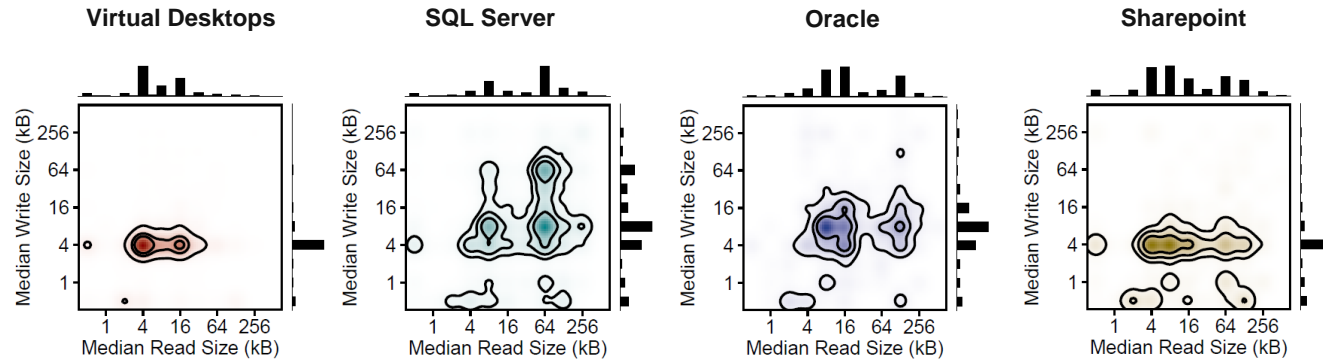
Example Output:

Array	Quantity	Expected CPU Use Per Array (%)
CS200	4	 59% +/- 10%
CS300	2	 54% +/- 10%
CS400	1	 58% +/- 19%
CS500	1	 40% +/- 16%
CS700	1	 34% +/- 14.5%

Hardware Models:



Application Models:



InfoSight Infrastructure Deep Dive

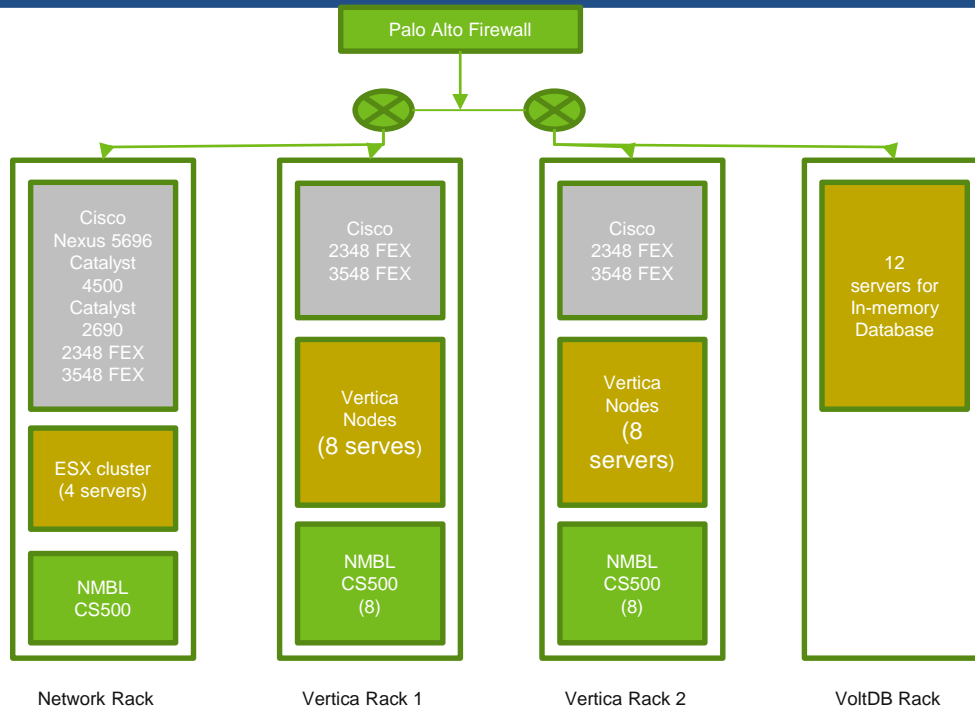
- **Size:** Vertica: 550TB Disk: 200 TB On Nimble: 100 TB

- Database Characteristics

- 350K selects per day
- 60K inserts/deletes per day
- 101610439346881 sensors
- Projections / Tables : 9815 /3434
- Highest number of columns in a table: 736

- Database Features

- Resource Pools
 - 15% performance benefits seen (Vertica PS team rocks!)
- Window functions, UDFs (R, C++)
- Encoding to reduce space usage



• Compute

- 54 cores Intel(R) Xeon(R) CPU E5-2697 v3 @ 2.60GHz
- SSD for OS
- 256 GB

• Operating System

- RHEL 6
- ESX 5.5

• Network

- 10GB VLANs
- Nimble CS500, 36TB, 3.2TB Flash

- Nimble Compression (550 TB → 100 TB on nimble)
- Local snapshots
 - Coming soon – App-aware snapshot tooling
- Nimble Replication
 - Network Bandwidth cost savings when moving data centers and managing DR !!
- InfoSight Backed Technical Support 😊



nimblestorage

Data Velocity Delivered™

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Thank you for providing your feedback, which helps us enhance content for future events.



Hewlett Packard
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Thank you