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The DCG Story – Our Brand Value Proposition
Today’s Business Realities

Stay Ahead
Innovate or die

Transform Now
Adapt and modernize

Do Everything Faster
Move at the speed of business
The Need to Innovate Brings IT Challenges

- **Adapt** for faster IT transitions
- **Gain advantage** from technology advances
- **Mind the gap** between operations and innovation

- Changing IT models
- Flexibility
- Scale
- Complexity
- Proprietary approaches
- Integration risk
- Growth top priority, but only 20% of budget available for innovation
Current Approaches Do Not Close the Gap

• Workload-optimized for today vs. tomorrow

• Incumbent provider isn’t the best choice

• Public cloud not the only path to simplicity
It’s More Difficult to Add Value Than to Cut Costs

“Half a century ago, the life expectancy of a firm in the Fortune 500 was around 75 years. Now it’s less than 15 years and declining even further.”¹

Success Requires a Future-Defined Strategy

• A secure and agile data center that accelerates IT delivery

• Refresh & modernize with unconstrained IT partners able to focus on customer needs

• SDI and Cloud to automate simplicity

• Optimal balance to scale and adapt
Enabling the Future-Defined Data Center

**Performance, reliability, and flexibility**

Data Center Infrastructure and Cloud Services

**Automation and efficiency**

Software Defined Infrastructure

**Scale and performance for the most demanding computing problems**

High Performance Computing

**Cost advantages on a massive scale**

Hyperscale Systems
Lenovo—Powering the Future-Defined Data Center

Introducing new solutions that eliminate the complexity in your data center—developed from world-class expertise, deep ecosystem collaboration, and a relentless pursuit of better.

- **ThinkSystem**
  - flexibility / reliability / performance

- **ThinkAgile**
  - simplicity / control / agility

- **Engineered Solutions**
  - validated / optimized / tested

- **Services**
  - comprehensive / customized / accessible

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Lenovo Partnerships—Better Choice and Greater Flexibility

• Synergy of strengths
  – Differentiation
  – Velocity
  – Reach

• No competition with partners – no legacy to protect

• Real-world testing for performance and reliability

• Simplified acquisition & integration
Services—a Relationship of Trust

• Customized for each customer need supporting all phases of the IT lifecycle

• In collaboration with partner ecosystem

• Achieving faster time to value

• Delivering best customer experience

#1 customer support

2.4M machines in warranty and maintenance

165 countries with Lenovo support teams

+10K IT support specialists

51 contact centers

Fulfilling Our Commitment—Delivering Better Outcomes

Customer Centric Strategy
No legacy to slant focus—start fresh without starting over

Purpose Driven Innovation
Better answers to critical business challenges

Transformative Experience
Best experience in every interaction

More Agility
Actionable Insights
Lower Risk
Greater ROI
Lenovo Data Center Group Today

- ~6,000 employees globally
- ~2,000 developers in 7 R&D labs worldwide
- A complete data center portfolio
- customers in 160+ countries
- 20M+ servers deployed
- 5 Lenovo owned factories
- 18M+ network ports installed in Fortune 500
Purpose-driven Innovation Continues

A history dedicated to continuous increases on performance, agility and reliability

1999
1st 1U Tier 1 Rack Server

2002
1st Scalable 16-socket X86 server

2005
1st high availability hot-swap memory

2007
1st x86 server to break 1 million tpmC

2010
1st to decouple memory from processor

2012
1st warm water cooling technology

2014
1st Integrated memory channel flash storage

2014
1st to decouple memory from processor

2017
1st Mission-critical 8 way server in 4u form factor

2017
1st to decouple memory from processor

2017
Front / Rear modular Trays

2017
45 °C operating servers

2017
NVMe Direct

2017
Flexible I/O
A Strong Foundation

#1 Customer Satisfaction

In the latest TBR survey (2H 2016), Lenovo was #1 for the 6th consecutive study going back to January 2015, and in 22 of 28 studies since 2H 2009. Also, lead in 21 of 22 satisfaction attributes in latest survey.

#1 x86 Server Reliability

#1 in ITIC Reliability Survey for 4 years running.

#1 Microsoft SQL 2016 Performance

x3950 X6 TPC-H @ 30,000 GB non-clustered\(^1\), x3850 X6 TPC-H @ 10,000 GB non-clustered\(^2\), x3650 M5 TPC-E\(^3\) and x3850 X6 TPC-E\(^4\)

#1 SAP HANA Performance

Lenovo systems deliver world record SAP application performance\(^5\). Lenovo has shipped more than 7200 SAP HANA appliances worldwide.

#2 TOP500 HPC Vendor

Lenovo is the fastest growing TOP500 HPC vendor worldwide and ranks 2\(^{nd}\) in the number of fastest systems.

30 Current World Record x86 Benchmark

Lenovo enables faster data analysis.

#24 Gartner Supply Chain

Of 300 companies over $12B rev across industries recognizing supply chain leadership and best practices.

To be Updated for Purley

Results as of 7/11/2016.

1. http://www.tpc.org/3321
5. SAP BW & SAP SD 2 Tier
Experience Lenovo – Briefing and Innovation Centers
Interact with Lenovo experts and executives

Share
Discuss customer needs, share evolving industry trends, review Lenovo’s strategy and family of data center offerings.

Experience
Review and explore demonstrations of Lenovo’s data center solutions that can transform your data center

Prove
Collaborate with data center solution experts to validate industry leading solutions built on Lenovo server, storage and networking products
Building Trust in Every. Simple. Experience.

- **Customer first** in strategy and engagement

- Enabling the transition to next-gen **accessible, affordable and friction-free**

- **Lowering risk** from 25 years proven experience

- **High-velocity, flexible supply chain** delivering new integrated capabilities
We pursue better, so you can pursue the incredible.

Lenovo for the data center. Different is better.
ThinkSystem
Servers | Storage | Networking
The embodiment of purpose-driven innovation—Foundational server, storage, and networking platforms building solutions for the future-defined data center

**Leadership Performance**
Solving mankind’s most complex challenges—providing real-time insights at the speed of digital business

**Most Flexible Platform Design for Service Delivery**
Platforms adaptable to any need, and massive storage scale at cost and flexibility of public cloud

**Industry Leading Reliability**
Driving increased revenue and lowering OPEX
Server Platforms

Industry Leading Reliability— Servers for Cloud and Next-Gen IT

Racks and Towers
Most versatile platform for entry to business critical workloads

Dense Systems
Space optimized with extreme performance and energy efficiency

Blades
Easily managed integration of compute, storage and networking

Mission Critical
For scale-up applications with the largest workloads
Rack and Tower Servers

• Leadership cost / performance

• **More flexible** – configurations to span mainstream to performance oriented workloads

• **Integrates better** – unique XClarity design with RedFish integration

• **Reduce costs** – management and serviceability features that help lower TCO
Mission Critical Servers

• **Better uptime** – Unique front and rear access design enables faster system maintenance

• **Flexibility to optimize** – Unique ability to scale from 2 to 8 processor in a modular 4U rack

• **Pure performance** – optimized for leadership performance in large memory applications like SAP HANA
Blade Systems

- **Proven** – same Flex chassis—no new investment required

- **Optimized** – zoned cooling supports highest available CPU and RAM configurations

- **Flexible** – Midplane supports up to 100Gbps per server node enabling high performance workloads and protecting investment in the future

- **Integrates better** – Leadership system management that leverages industry standards like RedFish
Dense Systems

- **Better workload optimization** – Ultra-dense 2U 4N system for HPC, hyperconverged and general purpose workloads

- **Better performance** – design that supports unique IO shuttle, Omnipath and EDR Infiniband for HPC

- **Integrates better** – Leadership system management that leverages industry standards like RedFish

- **More flexibility** – Consolidated components across portfolio for better value and availability
Server Detail
Rack and Tower Systems

• Mainstream Leading Edge Technologies
  – 24 DIMM Memory Capacity
  – 205W CPUs SKUs

• Value+
  – 16 DIMM Memory Capacity
  – AnyBay™ technology supporting NVMe Storage

• All Models
  – Faster Memory
  – M.2 storage for rapid OS Boot
  – 12Gb SAS
  – XClarity Management

Mainstream

- SR630
- SR650

Value+

- SR570 (Available 4Q 2017)
- SR590 (Available 4Q 2017)

Value

- SR530
- SR550

ST550
Blades | Flex

- Composable Infrastructure Solution
  - Updated 2 and 4P Blades
  - 28 core CPUs with faster memory
  - LAN Direct—4x10GbE LOM—no mezz card needed
  - High performance mesh topology (4P)

- Same Flex Chassis!
  - Houses four generations of CPUs concurrently
  - 40% more dense than rack systems
  - New! 25Gb switch & mezz card (1Q 2018)
  - Optimized and zoned cooling supporting the highest available CPU & RAM configurations
  - Midplane supports 100Gb per server node
  - Carrier grade NEBS level 3 compliant choice for rugged Telco environments
Mission-Critical | SR950

• All-New 4U-8P mission-critical system
  – For SAP HANA & large in-memory databases and other workloads requiring maximum raw processing power

• 8P in 4U chassis
  – 2x the density of the prior generation
  – 3x the density of current Dell, HPE systems

• Improved serviceability
  – Modular chassis with slide-out tray speeds access to all subsystems
  – Up to 24 2.5” front drive bays, including up to 12 NVMe
4P Rack | SR850

• All-New 2U-4P System
  – For mid-sized databases, server consolidation and large scale virtualization

• Optimized for Growth
  – Scalable CPU 2 + 2 Mezz design
  – Large memory capacity - 48 DIMMs
  – 16 2.5” drive capacity, eight NVMe

• Value Delivered
  – 4P ring topology
  – NVMe Direct eliminates PCIe switch cards
  – AnyBay supports multiple storage options
Dense | SD530

• All-New 2U4N dense system
  – For HPC, AI, Machine Learning, and storage-dense hyperconverged infrastructure

• Screaming performance
  – Massively parallel architecture supporting up to 2 GPUs

• Improved serviceability
  – Rear shuttle reduces maintenance downtime by disaggregating IO, PDUs, and fans from nodes
  – Up to 24 2.5” front drive bays, including up to 8 NVMe
Dense Water Cooled Technology | SD650

• New Water cooled solution
  – For large-scale HPC installations

• High Performance Design
  – Same NeXtScale n1200 DWC Enclosure
  – Double wide tray with two independent nodes
  – Supports new CPUs up to 28 cores
  – Optional front-access OmniPath or Infiniband

• Energy Efficiency
  – Direct warm water cooling up to 50°C
  – Run in Turbo mode 24/7
  – Up to 40% energy savings vs. air cooled
  – Near silent operation (only PSU fans)
Storage Platforms

Revolutionizing Storage Economics

SAN
DS Series
V Series
DB Series FC SAN
Switches and Directors
High performance shared storage

DAS
D Series
E Series
Capacity expansion for servers or Software Defined Storage

SDS
DX8200C
DX8200N
DX8200D
Software Defined Storage for object, file/block, and storage virtualization

Archive
Tape Drive, Autoloader, Library
Low-cost long-term retention or infrequent access

DSS
DSS-G
DSS-C
Storage solutions for HPC and Distributed File Systems
SAN – DS Series

- **Leadership price / performance** – best-in-class pricing and lowest price / IOP per independent SPC\(^1\) benchmark (expected to be updated for current product)

- **Flexible and scalable** – Upgradeable controllers allow storage growth with no capacity licensing or hidden costs after systems are deployed

- **Reliable** – Built for five “9’s” availability

- **Management without complexity** – Setup in less than 15 minutes

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SAN – V Series

- **Flexibility to optimize** – Feature rich entry SAN offerings
- **Reliable** – 99.999% availability ensures limited downtime
- **More efficient** – Compress data with Real-time Compression (V5030 only) without impacting performance

1. IBM
DAS

• **Higher availability** – Built for five “9’s” ensures limited downtime

• **Higher Density** – D3284 supports 84 drives in one 5U format—1/3 less space than 2U format with equivalent drives—1.5 times the capacity of the competition

• **More flexible** – Perfect blend of high performance and high capacity

1. Lenovo Storage D3284 as of Sept 2016 compared with HP D6000
Software Defined Storage

**DX8200N**: Unified Block & File Storage

- **Leadership cost and scalability**
  - 50% lower CAPEX
  - Simple growth to 5PB

**DX8200C**: Object Storage

- **Reduced Costs**
  - Reduce cost to $.01 / GB / Month
  - Massive scalability – 100s of PBs
  - 100% S3 compatible platform

**DX8200D**: Storage Virtualization and ServerSAN

- **Unmatched storage economics**
  - Up to 90% increased productivity
  - 10x performance increase
  - 75% cost reduction

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1. Average cost savings per Nexenta customer vs. traditional storage
2. Gartner 2016 IT Key Metrics Data
3. Customer research by TechValidate
Archive

IBM LTO7 Tape Portfolio

• **Improved performance** –
  2.4X Capacity of LTO6
  87% Faster than LTO6

• **Cost-effective** – high capacity archive storage for long-term data retention

• **Secure** – protection and security with encryption to support long-term data retention requirements for compliance

• **Flexible** – backwards compatible to support older generation media
Distributed Storage for HPC

**Greater performance** – Declustered RAID reduces overhead and speeds rebuilds 4-8x

**Greater Reliability** – End-to-end checksum and 2 & 3 fault tolerance

**Reduce costs** – Software based controller reduces cost and enhances functionality and start small and grow as needed

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**DSS-G**: Distributed Storage Solution for IBM Spectrum Scale

Solution for large capacity, high performance HPC workloads

**DSS-C**: Distributed Storage Solution for SUSE Enterprise Storage

Solution for Lenovo scale-out HANA solutions

file and object storage offerings delivering high storage density and I/O performance with superior availability, reliability and resiliency
Storage Detail
DS4200

Use Cases
• DS4200 AFA – applications requiring SSD QoS at all times, but at an entry price
• DS4200 Hybrid – small percentage of hot data, balance SSD performance with HDD price
• DS4200 Traditional – streaming, sequential-dominated environments

Features
• Predictable performance
  – By excluding data reduction, Lenovo avoids the performance degradation seen in competing AFA solutions
• Thin provisioning and data protection

Tech Specs
• 235K IOPS* @ 1ms latency
• 7GB/s sequential read throughput
• 5.5GB/s sequential write throughput
• 16GB cache per system
• 8 ports per system
  – CNC (FC/iSCSI) or SAS host connect

*Virtual mode, performance tuning ongoing
DS6200

Use Cases
• DS6200 AFA – maximize application performance and response times for the most demanding environments, with price-leading midrange AFA

Features
• Predictable high performance
  – By excluding data reduction, Lenovo avoids the performance degradation seen in competing AFA solutions
• Low-cost controller architecture with high random performance
• SAS SSDs
• Enterprise Software Stack
  – Thin provisioning, fast rebuild and data protection features

Tech Specs
• 375K IOPS* @ 1ms latency
• 7GB/s sequential read throughput
• 5.5GB/s sequential write throughput
• 32GB cache per system
• 8 ports per system
  – CNC (FC/iSCSI) or SAS host connect

*Virtual mode, performance tuning ongoing
DX8200C Powered By Cloudian

Use Cases
- Large data sets (> 300TB)
- “New” data
- Geographically separate data
- Backup and restore
- Long term archiving

Features
- Massively scalability object storage
- 100% AWS/S3 object storage solution
- Easy, affordable scale-out
- Turnkey solution: pre-integrated, pre-tested appliance
- Data sharing across data centers and regions
- Based on proven Lenovo servers, ranked #1 in reliability
- XClarity for simple hardware management
- Single point of global contact support through Lenovo

56% Lower $TB/year TCO vs traditional storage¹
$0.01 per GB per month¹

¹ Gartner 2016 IT Key Metrics Data
DX8200N Powered By NexentaStor

Use Cases
- Large data sets (> 300TB)
- Unified block & file in one location
- Backup and archive
- File Storage & sharing
- Cloud backend

Features
- High performance, scalable unified block & file storage with unlimited file size
- Massive storage scalability
- Inline compression on full system
- Turnkey solution: pre-integrated, pre-tested appliance
- Based on proven Lenovo servers, ranked #1 in reliability
- XClarity for simple hardware management
- Single point of global contact support through Lenovo

50% Lower CAPEX

\(^{1}\) Average cost savings per Nexenta customer vs traditional storage
DX8200D Powered By DataCore

Use Cases
- Data sets up to 256TB
- Block and file storage virtualization
- Performance and application acceleration
- Business Continuity/Disaster Recovery

Features
- Virtualize external Block & File storage HW to maximize utilization
- Performance & Application Acceleration
- “Zero downtime, zero touch” availability
- Scale-up and/or scale-out on demand
- Confidently deploy pre-integrated, pre-tested appliance
- Based on proven Lenovo servers
- Single point of contact support

75% Cost Reduction
100% Less downtime
10% Performance increase

* DataCore customer research by TechValidate, 2016
Flexible **Networking** for all data center needs

- **Top of Rack**
  ThinkSystem RackSwitch
  Leaf-spine optimized for data center

- **Embedded**
  Flex System
  Integrated blade system connectivity

- **Network OS / Management**
  CNOS / VMware, OpenStack, XClarity, Ansible
  Resiliency, scale and automation for cloud environments

- **Juniper Portfolio**
  Campus and Core
  For full end-to-end data center solutions
Top of Rack

RackSwitch G7000 family
Cost effective 1GbE / Layer 2

RackSwitch G8000 family
1, 10, 40GbE, Converged & SDN / Layer 2&3

ThinkSystem NE family
10GbE,10GBase-T; 25/100Gb – SS June-Sept

• Leadership cost / performance

• More flexible – configurations to span mainstream to performance oriented workloads

• Integrates better – Deep support for third party management ecosystem and eliminates lock-in
Embedded

Flex System Networking
Ethernet, Fibre Channel, Infiniband connectivity for Flex Systems

• **Scalability** – unlock additional ports with *Features on Demand* instead of removing & adding more switches

• **Flexibility** – Reallocate internal and external ports as needed with *Flexible Port Mapping*

• **Management without complexity** – *Flex System Interconnect Fabric* simplifies management of large scale clusters—manage 9 switches as one
Network OS and Management

- **Reduce operational costs** – management and serviceability features that help lower TCO
- **Integrates better** – features that support hybrid cloud implementations and east/west network architectures
- **Open** – architecture with future support for third party software
- **Agile** – telemetry features in the switch to drive QOS analytics reducing downtime - June
• **IT Agility** – Faster time-to-application with a simplified, high-performance solution.

• **Carrier-class & secure** – switches & routers for branch, campus, and data center
  – 20K+ Juniper customers
  – 15M+ ports deployed

• **More flexible and scalable** – a complete, more manageable, and simpler infrastructure for the data center with Lenovo and Juniper
ThinkAgile
Software Defined Next-Gen IT
Transformative Next-Gen IT for software-defined infrastructure, with the ease and speed of public cloud and the control of on-premises IT

**IT Agility**
Software defined infrastructure with foundational ThinkSystem platforms and ecosystem partners

**TCO savings**
Engineered and validated to simplify deployment and management of integrated solutions

**Transformative experience**
Better end-to-end experience throughout the product lifecycle
ThinkAgile IT

Transformative IT for Software Defined Infrastructure

Hyperconverged Infrastructure
HX – Nutanix VMware Ready Nodes
Pre-integrated turnkey solution appliances and tested, pre-certified configurations ready to deploy in hours

Software Defined Storage
SDS DX Series
Highly available, full-featured storage appliances

Software Defined Infrastructure
SX for Microsoft Azure Stack
SX for Nutanix VMware VCF Ready Nodes
Ease and speed of public cloud with the control of on-premises IT
Lenovo ThinkAgile HX

HX Appliance Solutions for the Data Center

• **Simplify IT infrastructure** – significantly reduces time and resources to maintain

• **Reduce costs and accelerate time to value** – 387% ROI; $3.2M in expected savings over 3 years; 85% faster application deployment; 56% less application downtime; 61% lower data center facilities cost; 2.8X lower storage TCO\(^1\)

• **Greater reliability** – Powered by the most reliable servers\(^2\) in the industry

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2. ITIC
Lenovo vSAN ReadyNodes
Optimized for a range of business critical workloads

**Hybrid Nodes**
- Caching tier
  - Reads and writes
  - High endurance flash devices
  - SSD, PCIe, Ultra Dimm, etc
- Capacity tier
  - Data persistence
  - SAS/NL SAS/SATA/Direct-attached JBOD
  - 40k IOPS per host

**All-flash Nodes**
- Caching tier
  - Writes
  - High endurance flash devices
  - SSD, PCIe, Ultra Dimm, etc
- Capacity tier
  - Reads
  - Flash Devices
  - 90k IOPS per host
  - Sub-millisecond latency
vSAN Certifications

1. vSAN ReadyNode™
Preconfigured server ready to use VSAN…

- Tested, pre-certified, ready-to-run Lenovo Configurations
- Listed on VMware HCL
- Guidelines for customization
- SR630, SR650 and SD350

2. Build your own
Choose individual components …

- Server on vSphere Hardware Compatibility List e.g. SR570 & SR590
- SAS/SATA SSD, NVMe SSD or PCIe SSD
- HDD or SSD for Capacity
- HBA or RAID Controller

…using the vSAN VMware HCL
Software Defined Storage

**DX8200N**: Unified Block & File

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---

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2. Gartner 2016 IT Key Metrics Data
3. Customer research by TechValidate
Ignite Transformation with ThinkAgile SX for Microsoft Azure Stack

Simplified, Consistent Hybrid Cloud
- Rack-scale, pre-integrated turnkey solution ready to deploy in hours
- On-premises Azure cloud services
- Enriched lifecycle management

Increased IT Agility
- Ships up to 2x faster than alternative solutions
- No disruption to tenant availability or experience
- Professional installation

Transformative Support
- Lenovo has co-innovated with Microsoft for more than 20 years
- Lenovo was 1st to market with Azure Stack demos and is working with over 40 early Azure Stack customers
- Reduce support time with single point of contact
Lenovo ThinkAgile SX

**SX for Nutanix:** Simplified turnkey system

**SX for Microsoft Azure Stack:** Simplified Hybrid Cloud

- **IT agility** – 80% faster Time to Value
- **TCO savings** – 23% OPEX savings vs. traditional; 33% TCO savings vs. competition

3. Comparison using Lenovo VDI Reference Architecture compared with VCE Vblock 340 implementation guide for 1,000 VDI seats; Sep 2015
Lenovo VCF Ready Nodes (available summer 2017)

Next generation hyper-converged building blocks

Operational Consistency
Existing Skillsets & Tools
Control, Manage, Secure
Enterprise-class App SLA
Compatibility with Apps

Based on Lenovo Pre-Validated VSAN Ready Nodes™

Tested and certified for delivering VMware Cloud Foundation software defined datacenter

VCF compatible configurations can be found on the VCF compatibility guide

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Engineered Solutions
ENGINEERED SOLUTIONS

Architected for better business outcomes
Validated and tested Industry leading ISV solutions—with unique IP

Simplified acquisition
Best practice end-to-end documentation

Better experience
Service and support throughout the lifecycle

Solving complex infrastructure, workload and service delivery challenges
Lenovo Engineered Solutions

Accelerating Value, Reducing Risk and Complexity

**Cloud**
Efficient and simplified management of compute, storage and networking

**Big Data**
Gathering & analyzing volumes of raw data to generate value and profits

**Analytics**
Accelerate decision making and gain insights into key trends

**Database**
Manage data quickly to support analytic and transactional applications

**Client Virtualization**
Keep data secure and applications scalable for remote and mobile users

**Logos**
- openstack
- Cloudera
- SAP HANA
- SAP
- Citrix
- Microsoft
- IBM
- Oracle
- MapR
- VMware
- Red Hat
- Hortonworks
- Apache Spark

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Lenovo Engineered Cloud Solutions

- **Better performance** –
  - #1 world record for virtualized workloads\(^1\)

- **Reduce complexity** with 6 steps to cloud OpenStack deployment\(^2,3\)
  - XClarity Administrator, delivers physical infrastructure like software
    - 48% Less time to deploy than competition\(^4\)
    - 72% Fewer steps to deploy than competition\(^5\)

- **Services** to install, manage and maintain

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1. 6 Top x86 2 socket SPECvirt_sc2013 performance benchmarks; Summary – As of March 27, 2017
3. https://www.youtube.com/watch?v=Om2gznGOo
Lenovo Engineered Big Data Solutions

- Only major OEM supporting **all four Big Data distributions**
- **Industry first** 100TB Spark SQL Benchmark
- **Services** to install, manage and maintain

1. Lenovo Big Data Configuration for Apache Spark
Lenovo Engineered Data Analytics Solutions

SAP S/4HANA®
SAP BW/4HANA
SAP Business One with SAP HANA
SAP VORA with MapR & SUSE
SAP IT Operations Analytics with XClarity integration

Standard configuration templates, and other partner related solutions

• 31% lower TCO over 3 years\(^1\) for SAP HANA systems

• Over 7200 SAP HANA systems shipped worldwide

• World record SAP application performance – SAP BW\(^2\) and SD 2\(^3\) tier benchmarks

• SAP runs their SAP HANA platform on Lenovo systems

• 2016 SAP HANA Innovation Award winner and one of the largest SAP HANA instances in AP\(^4\)

• Professional Services for Installation, Integration, Configuration and Remote Management

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1. “Comparing Costs and Effectiveness of Lenovo System x for SAP HANA Deployment,” December 2016, Quark + Lepton
2. [https://lenovopress.com/60161-x3850-x6-sapbw4hana-benchmark-result-2017-02-01](https://lenovopress.com/60161-x3850-x6-sapbw4hana-benchmark-result-2017-02-01)
3. [https://lenovopress.com/60165-x3950-x6-sapsd-benchmark-result-2017-02-01](https://lenovopress.com/60165-x3950-x6-sapsd-benchmark-result-2017-02-01)
4. [https://ideas.sap.com/001262](https://ideas.sap.com/001262)
Lenovo Engineered Database Solutions

Microsoft SQL Server
Pre-tested, performance-tuned Microsoft SQL Server Transactional and Data Warehouse Fast Track Solutions

SAP
SAP HANA appliances and TDI offerings

Exchange
Microsoft Exchange on ThinkAgile HX

ORACLE
High performance and high availability solutions for Oracle 12c

- More SQL Server certified choices than any other—from 6-145TB
- #1 30TB Microsoft Data Warehouse performance\(^1\)
- 31% lower TCO over 3 years\(^2\) with SAP HANA
- Services to install, manage and maintain

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1. TPC-H 30TB Benchmark Result Derived from TPC-E benchmark results and list price of system configurations required to achieve comparable transactional performance for System x3950 X6
2. "Comparing Costs and Effectiveness of Lenovo System x for SAP HANA Deployment," December 2016, Quark + Lepton
Lenovo Engineered Client Virtualization Solutions

• Resilient, validated infrastructure solution to fast path BYOD and Desktop-as-a-Service
  – Array of infrastructure choices for general purpose workloads
  – Accelerated graphics workloads
  – Hyper-converged solutions and shared storage deployments

• Services to install, manage and maintain

Validated and tested reference architectures for:
VMware Horizon with All-Flash VSAN
VMware Horizon on ThinkAgile HX

Validated and tested reference architectures for:
Citrix XenServer on ThinkAgile HX
Lenovo Services Supports the Full IT Lifecycle

Planning → Fulfillment → Deployment → Support → Optimization → End of Life

- Assessment Workshop
- Factory Services
- Basic Hardware Installation
- Managed Services
- Enterprise Server Software Support
- Health Checks
- Asset Recovery Services

- TCO Study
- Solution Design
- Integration, Migration, and Expansion
- YourDrive YourData
- Warranty
- Upgrades and Extensions
- Post-Warranty Services

- Proof-of-Concept Technology Lab
Planning
Understand your options, evaluate deployment alternatives, and design the best IT strategy for your enterprise

**Assessment Workshop**
Identify opportunities for system and infrastructure improvements

**TCO Study**
Explore detailed recommendations for the most cost-effective solutions

**Solution Design**
Leverage Lenovo expertise to speed time to value and optimize IT investments

**Proof-of-Concept Technology Lab**
Mitigate risk by validating and tuning solutions in a controlled environment
Fulfillment
Reduce project time and costs by having Lenovo perform configuration, deployment, and quality assurance tasks at the point of manufacturing—before shipping to the customer.

Factory Integrated Services
Accelerate deployment time and decrease risk by relying on experienced installation and testing technicians.
Deployment
Simplify installation of new technologies, accelerate time to productivity, and free your IT staff to concentrate on business priorities

Basic Hardware Installation
Keep IT staff focused on your business by relying on Lenovo experts to configure and install new infrastructure

Integration, Migration, and Expansion
Move or scale IT resources intelligently and cost-effectively

Design and Deployment Services
VMware vRealize Suite, VMware NSX, HX Series Nutanix Appliances, ThinkAgile CX Series, Lenovo StorSelect, and HPC
Lenovo Services

Support
Rely on Lenovo experts 24x7 to help ensure everyone in your organization has the tools they need—around the world and around the clock.

Managed Services
Rely on experts for continuous system monitoring and problem resolution for both hardware and software.

Enterprise Server Software Support
Enjoy unlimited access to comprehensive software support from a single source.

Warranty Upgrades and Extensions
Provide uninterrupted coverage to match the planned life of your IT assets.

YourDrive YourData
Add extra protection for your data by keeping failed hard drives.

Post-Warranty Services
Add one to two years of support coverage after the base warranty expires.
Optimization
Monitor and enhance your Lenovo technologies throughout their lifecycle to ensure top performance and protect your investments

Health Checks
Ensure optimum infrastructure tuning and practices at all times
End-of-Life
Retire hardware assets responsibly and help ensure compliance with technology disposal regulations and best practices

Asset Recovery Services
Dispose of retired hardware responsibly, securely, and easily
Worldwide Services Delivery Network

• 165 countries
• 12 development labs
• 10,000+ IT support specialists
• 3,000 field service locations
• 51 contact centers
• 147 languages
• ~2.4 million machines in warranty and maintenance
#1 Customer Satisfaction

“They have some of the **fastest delivery and setup times across the industry** and also provide updates in real time to their clients.”

“They have been **available and responsive**. Most importantly, they are **knowledgeable and capable**.”

“The post-purchase customer **care has been amazing**, and they are **super supportive**.”

---

High Performance Computing and AI
Lenovo’s **deep technical expertise** helping solve society’s most complex challenges

**High Performance Computing / AI**

**Experience and Expertise**
Deep industry knowledge and technical skills—enabling specialization for maximum performance for a broad set of workloads

**Flexibility**
Co-design with customers and leading partners to truly optimize designs for results

**Open Everything**
A broad portfolio of Lenovo systems linked to open partnerships delivering the benefits of Open HPC to all customers
HPC Solutions

- High Performance Technical Computing
  - Traditional simulation and engineering

- High Performance Data Analytics
  - Big Data & analytical decision support

- Oil and Gas
- FSS
- Weather
- Life Sciences
- CAE

Customizing solutions for each customer’s unique needs with extreme density and datacenter efficiency
HPC Standards Matter

Lenovo participates in 21 different hardware and software standards organizations.
Giving Back—Active OpenHPC Membership

GOLD Corporate Member

• Maintainer for System Management component
• Participate as Technical Steering Committee member
• Lead the xCAT/Confluent integration and testing

http://www.openhpc.community/about-us/participants/
Leadership Performance and Innovation

92 entries in Top500
#2 most overall placements on list of the most powerful supercomputers in the world\(^1\)

Lenovo—Fastest growing HPC vendor in 2016 at 17% YTY growth\(^2\)

First warm water cooled supercomputer

1. [https://www.top500.org](https://www.top500.org)
2. IDC
Lenovo Supercomputers around the world

**US**
Lenovo powers research innovation at:
- Harvard University
- MIT
- Caltech
- Princeton University
- Yale University
- University of Chicago

**UK**
Largest Astrophysics computer worldwide
Lenovo powers research innovation at:
- University of Oxford
- Imperial College London

**Denmark**
Largest Supercomputer built on Lenovo systems

**Germany**
Largest water-cooled system in world built on Lenovo systems

**Italy**
Largest Supercomputer built on Lenovo systems
3 of top 6 supercomputers are built on Lenovo systems

**Asia**
Lenovo powers more Supercomputers in Asia than anyone else

**China**
Twice as many supercomputers than closest competitor

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Lenovo HPC—the Brawn Behind the Brains

Lenovo is powering life changing research at

11 out of the top 15

19 out of the top 25

Research Universities* in the world

* World Rank Sources: 2016 Elsevier Research (topuniversities.com)
Helping Researchers and Companies Make Immediate Impact

Challenge What Is Possible

Best Cost, Speed and Skill

Delivering Unique Thinking

[Logos of various institutions]
<table>
<thead>
<tr>
<th>Fastest growing HPC company in the world with 17% year-to-year growth&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Deployed 1,400,000 meters of ultra high-speed network cable&lt;sup&gt;2&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shipped 1,000,000 procs for HPC clusters&lt;sup&gt;2&lt;/sup&gt; (embargoed till Jun 20)</td>
<td>Shipped 12,750,000 processor cores for HPC clusters&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

| First to break the 1 PetaFlop barrier on x86 with BladeCenter H<sup>3</sup> | First HPC provider to test and certify Ubuntu Linux on HPC clusters<sup>4</sup> |

<table>
<thead>
<tr>
<th></th>
<th>Fastest growing Supercomputer provider WW From 9 to 92 Supercomputers in two years (Nov 2014 to June 2017)&lt;sup&gt;5&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4,240,000 supercomputer cores in production today 111% &gt; Fujitsu, 329% &gt; Bull Atos Group, 404% &gt; Dell, 1009% &gt; Huawei&lt;sup&gt;5&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Delivered world’s first warm water cooled Supercomputer; LRZ Delivers 35% less OPEX than air-cooled systems&lt;sup&gt;6&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Delivered Denmark’s largest Supercomputer; Abacus 2.0 Helped discover previously unknown pathway of bacterial infections&lt;sup&gt;7&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Delivered World’s largest Supercomputer for Astrophysics Helped understand implication of black hole phenomenon to our world&lt;sup&gt;8&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Delivered more Supercomputers in China vs. any competitor 74% &gt; Sugon, 355% &gt; Inspur, 811% &gt; HPE, 4000% &gt; IBM or Dell&lt;sup&gt;5&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Delivered most Supercomputers in Germany More than Cray, 4X more than HPE&lt;sup&gt;9&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Delivered largest AI training cluster in Australia University of Adelaide&lt;sup&gt;10&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Delivered largest water cooled Supercomputer in Asia Metrological Malaysia&lt;sup&gt;11&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

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Hyperscale
Hyperscale

Customer centric
In-depth engagements to understand needs and rapidly deliver customized platforms

Innovation on demand
Rapidly develop industry-leading technology to provide lower TCO and value-add

Transformative experience
Optimized hyperscale customer eXpress launch process for frequent changes and dynamic fulfillment

A leadership capability model from design through manufacturing, integration and support—for innovative cloud data center providers
Delivering the Hyperscale Data Center

Design and Procure
- Leading architects to improve and co-innovate designs with flexibility to create customer defined procurement models

Build and Deliver
- Industry leading global supply chain & Lenovo owned manufacturing to build & deliver worldwide with best in class change management to mitigate production risk

Deploy and Support
- Rack and roll capabilities with dedicated customer management support team and customized maintenance services
XClarity Systems Management
XClarity Approach to Data Center Management

**XClarity Energy Manager**
Visibility and Policy-Based Control Over Server Power and Thermals

**XClarity Integrators**
Deliver ThinkSystem and ThinkAgile from Your Own IT Processes and Tools

**XClarity Administrator, Pro, and Mobile**
Fast, Flexible, and Scalable Infrastructure Deployment

**XClarity Essentials**
Suite of Utilities for ThinkSystem Servers

**XClarity Provisioning Manager**
Embedded Provisioning Tool Common in All ThinkSystem Servers

**XClarity Controller**
Embedded Management Engine Common in All ThinkSystem Servers

**Integrates with existing environments**
Easily extends established frameworks for managing IT infrastructure and processes

**Simplified management**
No specialized training or skills needed to establish repeatable processes for managing the environment or individual systems

**A foundation of industry standards**
Increase compatibility with management environments making it easier to deploy new technologies
Lenovo’s XClarity – A Customer Centric Approach to Systems Management

Simplify

Deliver hardware like software and automate complex infrastructure tasks

Integrate

Deliver hardware with IT apps by integrating REST APIs, running available software plugins, or scripting

Accelerate

Accelerate and scale system deployment to reduce time to market of critical systems and workloads

Infrastructure Tools

Operations Management

Orchestration Engines

Redfish
XClarity Controller

• All-New Management Engine
  – Succeeds IMMv2

• Elegant User Experience
  – Fresh & uncluttered graphical interface

• Modernized Inter-operability
  – Built on Redfish-compliant APIs

• Vastly Improved Performance
  – 2x faster boot time to OS screen
  – 6x faster firmware updates
XClarity Simplifies Installation and Configuration Tasks

For installation and configuration tasks than performing them manually. **Principled Technologies test report Faster and More Efficient System Management with Lenovo XClarity Administrator**

For installation and configuration tasks using XClarity vs. Cisco UCS Manager. **Principled Technologies test report Faster and More Efficient System Management with Lenovo XClarity Administrator vs. Cisco UCS Manager**

For installation and configuration tasks using XClarity vs. HPE ONEVIEW. **Principled Technologies test report Faster and More Efficient Flex System Management with Lenovo XClarity Administrator vs. HP OneView**

For firmware update tasks using XClarity vs. Cisco UCS Manager. **Principled Technologies test report Faster and More Efficient System Management with Lenovo XClarity Administrator vs. Cisco UCS Manager**

For firmware update tasks using XClarity vs. HP ONEVIEW. **Principled Technologies test report Faster and More Efficient Flex System Management with Lenovo XClarity Administrator vs. HP OneView**
Strategic Alliances

Collaborating to address the most demanding customer needs
**Lenovo and SAP**

Driving digital transformation with next-generation applications and analytics

- Over **7200** SAP HANA systems shipped worldwide
- **Co-Innovation** and Center of Competence with SAP
- **World record** SAP application **performance** – SAP BW² and SD ²³ tier benchmarks
- **31% lower TCO** over 3 years¹ for SAP HANA systems
- **SAP runs their SAP** HANA platform on Lenovo systems
- Lenovo knows SAP: 2016 SAP HANA **Innovation Award** winner and one of the largest SAP HANA instances in AP⁴
- **Services** to install, manage and maintain
- **# 1 in server quality** – Required for mission critical SAP applications
- **Zero** overlap of competitive products Unlike other SAP partners – Teaming with SI’s

- Lenovo Solution for SAP HANA®
  - SAP S/4HANA®
  - SAP BW/4HANA
- Lenovo Solution for SAP Business Suite
- Lenovo Solution for SAP NetWeaver® Business Warehouse Accelerator
- Lenovo Solution for SAP Business One® for SAP HANA
- Lenovo Solution for SAP VORA
- Lenovo Solution for SAP IT Operations Analytics with XClarity integration
- Lenovo Services (design, factory services, deployment, support)

¹. “Comparing Costs and Effectiveness of Lenovo System x for SAP HANA Deployment,” December 2016, Quark + Lepton
². https://lenovopress.com/lp0616-x3850-x6-sapbw4hana-benchmark-result-2017-02-07
⁴. https://ideas.sap.com/D31262
Changing the economics of next-gen open source private/hybrid clouds

• Lenovo and Red Hat working together for hybrid cloud solutions
• Dozens of OpenStack Certified Delivery Engineers in Lenovo
• 3 of the 6 Broadwell performance records* on 3650 M5 set with Red Hat Linux
• #1 in server quality, making a Red Hat + Lenovo Cloud solution the most reliable of any Red Hat OEM solutions
• Platinum member of Open Platform for NFV (OPNFV)

• Cloud Solutions for the Data Center
• OpenStack Delivery Services from Lenovo
• Full Product Availability (Linux, Storage, Virtualization, etc.)
• Telco Solutions for NFV

* Results as of 7/1/2016
  • Top 2 socket x86 (https://www.spec.org/virt_sc2013/results/res2016q2/virt_sc2013-20160419-00049-perf.html)
• # 1 in server quality, making a VMware + Lenovo virtualization solutions the most reliable of any VMware OEM solutions

• No competitive overlap, unlike other VMware OEM partners

• Lenovo is the only OEM with capability to offer device to datacenter solutions

• Joint development of ready nodes, appliances and validated designs

• vSAN Ready Nodes
• VCF Ready Nodes (1H2017)
• Cloud
  – Lenovo Cloud Validated Design for VMware SDDC (6/20)
  – Lenovo Validated Design for VMware vCloud Suite (6/20)
  – VMware SDDC for vSphere 6.5
  – VMware SDDC vCloud Air Hybrid
• Client Virtualization
  – VMware Horizon 7
• xClarity integration with vRealize

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Lenovo and Microsoft

• Alliance Highlights
  – Relationship of more than 12 years
  – Co-located Engineering Dev Teams
  – Highest SQL Server 2016 Performance*
  – 1 of 3 GA partners for Azure Stack

• Joint Development
  – Azure Stack
  – MS Storage Spaces Direct (S2D)
  – SQL Server

• Traditional OEM
  – Leading OEM for SMB ROK Solutions

• Cloud
  – ThinkAgile SX for Microsoft Azure Stack
  – Windows Server 2016 (Storage Spaces Direct (S2D) & Hyper-V)
  – Edge Cloud

• Database
  – Microsoft SQL Server 2016

* Results as of 7/11/2016.
1. http://www.tpc.org/3321
Lenovo and Nutanix

Simplify and reduce the operational cost of IT

- Jointly developed family of hyperconverged appliances
  - Long term commitment and ongoing investment

- Industry leading platform performance
  - Deploy on world-class hardware with leading uptime and reliability

- Clean business design and minimal product overlap

- Global sales and support infrastructure

- Lenovo Converged HX Series Appliances

- Solutions
  - MS Exchange 2013 RA
  - MS SQL Server 2014 RA
  - Big Data/Analytics: SAP Netweaver RA;
Lenovo and Juniper Networks

Designed to simplify data center networking

• End-to-end networking capability in the data center

• Lenovo converged and hyperconverged offerings integrated with Juniper networking

• Joint development around SDDC
  – integration of xClarity with Juniper Contrail and Network Director
  – to manage multiple switches from a single management point

• Simple to deploy and manage networking offerings
  – Access, Spine and Edge
  – Juniper core, security and SDN offerings

• Automation with smart orchestration tools

• Open industry standards and interoperability
Channel Partner Strategy
DCG Channel Principles

• Channel is “the” route to market

• You are key to expanding our reach

• We will be easier to do business with

• Goal is mutual growth in revenue and profit
Different Partners Better

• Channel-centric focus remains
  – New global channel program
  – Enhanced channel deal registration
  – New selling tools

• Product reliability and security you can trust

• Expanding engineered solutions
How we win together

• Lead with innovation
• Present solutions
• Capitalize on growth segments
• Leverage full portfolio
Partners Thrive with Lenovo Partner Engage Program

Simple

Lucrative

Empowering

Lenovo is investing in our business partner’s success—enabling their growth with systems and solutions their customers and S/Is want

~90% of Lenovo's business is through the channel

10,000+ WW Channel Partners

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Leadership Claims Summary

Compilation of claims found elsewhere in this document
# A Strong Foundation

<table>
<thead>
<tr>
<th>Customer Satisfaction</th>
<th>x86 Server Reliability</th>
<th>Microsoft SQL 2016 Performance</th>
<th>SAP HANA Performance</th>
<th>TOP500 HPC Vendor</th>
<th>Gartner Supply Chain</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>#1</td>
<td>#1</td>
<td>#1</td>
<td>#2</td>
<td>#24</td>
</tr>
</tbody>
</table>

In the latest TBR survey (2H 2016), Lenovo was #1 for the 6th consecutive study going back to January 2015, and in 22 of 28 studies since 2H 2009. Also, lead in 21 of 22 satisfaction attributes in latest survey.

1. x3950 X6 TPC-H @ 30,000 GB non-clustered\(^1\), x3850 X6 TPC-H @ 10,000 GB non-clustered\(^2\), x3650 M5 TPC-E\(^3\) and x3850 X6 TPC-E\(^4\)
2. Lenovo systems deliver world record SAP application performance\(^5\). Lenovo has shipped more than 7200 SAP HANA appliances worldwide.
3. Lenovo is the fastest growing TOP500 HPC vendor worldwide and ranks 2\(^{nd}\) in the number of fastest systems.
4. Lenovo enables faster data analysis.

Of 300 companies over $12B rev across industries recognizing supply chain leadership and best practices.

---

Results as of 7/11/2016.

1. [http://www.tpc.org/3321](http://www.tpc.org/3321)
2. [http://www.tpc.org/3325](http://www.tpc.org/3325)
3. [http://www.tpc.org/4078](http://www.tpc.org/4078)
4. [http://www.tpc.org/4078](http://www.tpc.org/4078)
5. SAP BW & SAP SD 2 Tier
## Performance Benchmarks

### 32 Current World Records

<table>
<thead>
<tr>
<th>Category</th>
<th>Benchmark</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transaction Processing</td>
<td>TPC-E</td>
<td>3</td>
</tr>
<tr>
<td>Virtualization</td>
<td>SPECvirt</td>
<td>6</td>
</tr>
<tr>
<td>Compute</td>
<td>SPECcpu</td>
<td>2</td>
</tr>
<tr>
<td>Business Intelligence &amp; Decision Support</td>
<td>TPC-H</td>
<td>1</td>
</tr>
<tr>
<td>Data Analytics</td>
<td>STAC-M3</td>
<td>15</td>
</tr>
<tr>
<td>Business Applications</td>
<td>SAP SD Tier 2</td>
<td>2</td>
</tr>
<tr>
<td>Data Warehouse</td>
<td>SAP BWoH</td>
<td>3</td>
</tr>
</tbody>
</table>
# Lenovo Corporate Claims

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>$43B</strong></td>
<td><strong>Lenovo Revenue</strong></td>
</tr>
<tr>
<td><strong>~55K</strong></td>
<td><strong>Lenovo Employees</strong></td>
</tr>
<tr>
<td><strong>160+</strong></td>
<td><strong>Countries</strong></td>
</tr>
<tr>
<td><strong>7/17/5</strong></td>
<td><strong>A globally diverse leadership team</strong></td>
</tr>
<tr>
<td><strong>36/7/71</strong></td>
<td><strong>Worldwide facilities</strong></td>
</tr>
<tr>
<td>#1</td>
<td>TBR x86 Server Customer Satisfaction</td>
</tr>
<tr>
<td>#4</td>
<td>Worldwide x86 Server Market Share</td>
</tr>
<tr>
<td>150+</td>
<td>Historical World Record Benchmarks</td>
</tr>
<tr>
<td>#1</td>
<td>Lenovo Data Center Product Security</td>
</tr>
<tr>
<td>5</td>
<td>Lenovo Owned Server Manufacturing Sites</td>
</tr>
<tr>
<td>7</td>
<td>Labs Globally</td>
</tr>
<tr>
<td>~6,000</td>
<td>DCG Employees</td>
</tr>
<tr>
<td>~2000</td>
<td>DCG Developers</td>
</tr>
<tr>
<td>1800</td>
<td>Dedicated DCG Sellers</td>
</tr>
</tbody>
</table>
## DCG Claims

<table>
<thead>
<tr>
<th>25+</th>
<th>Years in the data center business</th>
<th>Experience in the server businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>20M+</td>
<td>Servers Sold</td>
<td>Over 20M Servers sold (combined IBM x86 and Lenovo server businesses)</td>
</tr>
<tr>
<td>18M+</td>
<td>Network Ports Installed</td>
<td>Over 18M network ports installed at Fortune 500 companies</td>
</tr>
<tr>
<td>32%</td>
<td>Product Quality Improvement</td>
<td>Lenovo improved its x86 server quality by 32% as measured by field repair actions reductions on System x from 2014 to early 2017. Source: Internal Study according to Lenovo internal repair action statistics.</td>
</tr>
<tr>
<td>99.998%</td>
<td>Product Availability</td>
<td>Lenovo servers can help achieve mission-critical hardware availability of up to 99.998% when combined with Lenovo committed repair service offerings. Source: Internal Study according to Lenovo internal repair action statistics.</td>
</tr>
<tr>
<td>3X</td>
<td>Higher Supplier Quality Standards</td>
<td>Lenovo demands about 1% first time pass yield failure rates on components into our factories – our competitors tolerate around 3% failure rates. Failure rates (1%) are still high, but 2-3x worse for our competitors. Data comes from supplier information and employees with this knowledge</td>
</tr>
<tr>
<td>90%</td>
<td>On-Time Delivery</td>
<td>For over 2 years, Lenovo has had the lead over Dell and HPE in delivery time and product availability in TBR’s NA customer satisfaction survey. Source: TBR 2H2016 – 2H16 Corporate IT Buying Behavior and Customer Satisfaction Study”, December 2016, <a href="http://www.lenovo.com/images/products/system-x/pdfs/white-papers/tbr_x86servers_top_csat_2h16_wp.pdf">http://www.lenovo.com/images/products/system-x/pdfs/white-papers/tbr_x86servers_top_csat_2h16_wp.pdf</a></td>
</tr>
<tr>
<td>41%</td>
<td>YOY Improvement in IFIR Rate</td>
<td>Lenovo has continuously improved in our “field incident rate,” 41% improvement in the past 10 months (as of June 2017). Further, competition measures their field incidence rates at 60 or 90 day while we measure at 120 days – a more demanding metric. Data comes from supplier information and employees with this knowledge</td>
</tr>
<tr>
<td>90%</td>
<td>Product Shipments via Channel</td>
<td>90% of Lenovo’s data center business is through the channel.</td>
</tr>
<tr>
<td>10,000+</td>
<td>Channel Partners</td>
<td>Lenovo has over 10K channel partners worldwide.</td>
</tr>
</tbody>
</table>
Differentiated Product Claims
## Services Claims

<table>
<thead>
<tr>
<th>2.4M+ Machines currently supported</th>
<th>Customers with more than 2.4 million Lenovo servers already take advantage of our warranty services support and maintenance offerings</th>
</tr>
</thead>
<tbody>
<tr>
<td>165 Countries with Lenovo support teams</td>
<td></td>
</tr>
<tr>
<td>+10K IT Support specialists</td>
<td></td>
</tr>
<tr>
<td>51 Support contact centers</td>
<td>Delivering best customer experience</td>
</tr>
<tr>
<td>3000 Field service locations</td>
<td></td>
</tr>
</tbody>
</table>
## Solutions Claims

| #1 | Microsoft SQL 2016 Performance | x3950 X6 TPC-H @ 30,000 GB non-clustered\(^1\), x3850 X6 TPC-H @ 10,000 GB non-clustered\(^2\), x3650 M5 TPC-E\(^3\) and x3850 X6 TPC-E\(^4\)  
|---|---|---|
| #1 | SAP HANA Server Installations | Lenovo systems deliver world record SAP application performance\(^5\). Lenovo has shipped more than 7200 SAP HANA appliances worldwide.  
#1 HANA Appliance Vendor - According to SAP, March 2015 |
<p>| 6 | Steps to cloud OpenStack deployment | Source: <a href="https://www.lenovo.com/images/products/system-x/pdfs/white-papers/rhel_osp_deployment_guide_wp.pdf">https://www.lenovo.com/images/products/system-x/pdfs/white-papers/rhel_osp_deployment_guide_wp.pdf</a>, <a href="https://www.youtube.com/watch?v=__Om2gznGOo">https://www.youtube.com/watch?v=__Om2gznGOo</a> |
| 4 | Only major OEM supporting all four Big Data distributions | |</p>
<table>
<thead>
<tr>
<th>SAP Claims</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>31%</strong></td>
</tr>
<tr>
<td><strong>7200</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
## Mission Critical Claims

| Flexibility to optimize | Unique ability to scale from 2 to 8 processor in a modular 4U rack |
## Storage Claims

<table>
<thead>
<tr>
<th>Leadership</th>
<th>Price / Performance for DS Series SAN</th>
<th>best-in-class pricing and lowest price / IOP per independent SPC¹ benchmark. Source: For price / performance optimized category of Traditional Entry SAN offerings consisting of controller-based configurations will have a total price up to $25,000. The SPC-1 Executive Summary and Full Disclosure Report (FDR) are available at: <a href="http://spcresults.com/benchmark_results_spc1_active/#a00181">http://spcresults.com/benchmark_results_spc1_active/#a00181</a> 29 August 2016 (S2200)</th>
</tr>
</thead>
<tbody>
<tr>
<td>99.999%</td>
<td>Availability for V Series SAN</td>
<td>99.999% availability on V Series SAN ensures limited downtime. Source: IBM PartnerWorld site marketing collateral: Gen 2 V5000 Customer Presentation – April 6, 2016; Carlos Kohan, IBM Storage OEM Global Market Development</td>
</tr>
<tr>
<td>50%</td>
<td>lower CAPEX with DX8200N</td>
<td>Average cost savings per Nexenta customer vs. traditional storage</td>
</tr>
<tr>
<td>1 Cent</td>
<td>Cost per GB per month with DX8200C</td>
<td>Reduce cost to $.01 / GB / Month with DX8200C. Source: Gartner 2016 IT Key Metrics Data</td>
</tr>
<tr>
<td>56%</td>
<td>Lower TCO with DX8200C</td>
<td>Lower $TB/year TCO vs. traditional storage with DX8200C. Source: Gartner 2016 IT Key Metrics Data</td>
</tr>
<tr>
<td>75%</td>
<td>Cost reduction with DX8200D</td>
<td>Unmatched storage economics reported by DataCore customers. Source: Customer research by TechValidate</td>
</tr>
<tr>
<td>10x</td>
<td>Performance increase with DX8200D</td>
<td>Unmatched storage economics reported by DataCore customers. Source: Customer research by TechValidate</td>
</tr>
</tbody>
</table>

¹ Claim expected to be updated for current product

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<table>
<thead>
<tr>
<th><strong>ThinkAgile (HX) Claims</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>2.8x <strong>2.8X lower storage TCO</strong></td>
</tr>
</tbody>
</table>
## ThinkAgile (SX) Claims

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Claim Description</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>33%</td>
<td>33% TCO savings vs. competition</td>
<td>Comparison using Lenovo VDI Reference Architecture compared with VCE Vblock 340 implementation guide for 1,000 VDI seats; Sep 2015</td>
</tr>
</tbody>
</table>
# HPC Claims

<table>
<thead>
<tr>
<th>Rank</th>
<th>Claim</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>#2</td>
<td>TOP500 HPC Vendor</td>
<td>Lenovo is the fastest growing TOP500 HPC vendor worldwide and ranks 2nd in the number of fastest systems. From 9 to 92 Supercomputers in two years (Nov 2014 to June 2017. (The TOP500 project ranks and details the 500 most powerful non-distributed computer systems in the world. Source: <a href="https://www.top500.org/statistics/list/">https://www.top500.org/statistics/list/</a></td>
</tr>
<tr>
<td>92</td>
<td>92 entries in Top500</td>
<td>June 2015 achieved 2nd overall spot for number of systems listed. Source: <a href="https://www.top500.org/">https://www.top500.org/</a> (as of June 2017)</td>
</tr>
<tr>
<td>5</td>
<td>Top 50 Rankings</td>
<td>Lenovo holds 5 of the top 50 rankings in the TOP500 list. Source: <a href="https://www.top500.org/">https://www.top500.org/</a> (as of June 2017)</td>
</tr>
<tr>
<td>17%</td>
<td>Fastest growing HPC vendor</td>
<td>Lenovo was the fastest growing HPC provider in 2016 with 17% growth over 2015 revenues. Source: IDC (Now Hyperion Research HPC Qview)</td>
</tr>
<tr>
<td>11 of 15</td>
<td>Lenovo supercomputers are installed at 12 out of the top 15 Research Universities</td>
<td></td>
</tr>
<tr>
<td>19 of 25</td>
<td>Lenovo supercomputers are installed at 20 out of the top 25 Research Universities</td>
<td></td>
</tr>
<tr>
<td>#1</td>
<td>Fastest Skylake system</td>
<td>Lenovo has the fastest Skylake system on the list at #13 installed at Barcelona Supercomputer (as of June 2017)</td>
</tr>
<tr>
<td>1M</td>
<td>Shipped 1,000,000 procs for HPC clusters</td>
<td>Lenovo data since first cluster deployment, June 2016</td>
</tr>
<tr>
<td>1.4M</td>
<td>Deployed 1,400,000 meters of ultra high-speed network cable</td>
<td>Lenovo data since first cluster deployment, June 2016</td>
</tr>
<tr>
<td>12.75M</td>
<td>Shipped 12,750,000 processor cores for HPC clusters</td>
<td>Lenovo data since first cluster deployment, June 2016</td>
</tr>
</tbody>
</table>
### HPC Claims

<table>
<thead>
<tr>
<th><strong>1 PetaFlop</strong></th>
<th>First to break the 1 PetaFlop barrier on x86</th>
<th>First to break the 1 PetaFlop barrier on x86 with BladeCenter H. Linkpack performance benchmark result on BladeCenter H, AMD Opteron system and DDR Infiniband networking, 2008</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1st</strong></td>
<td>First to test and certify Ubuntu Linux on HPC clusters</td>
<td>First HPC provider to test and certify Ubuntu Linux on HPC clusters. HPC Interoperability Matrix publication with Ubuntu Linux support in Cluster environment</td>
</tr>
<tr>
<td><strong>4,240,000</strong></td>
<td>4,240,000 supercomputer cores in production today</td>
<td>111% &gt; Fujitsu, 329% &gt; Bull Atos Group, 404% &gt; Dell, 1009% &gt; Huawei. Source: <a href="https://www.top500.org/">https://www.top500.org/</a></td>
</tr>
<tr>
<td><strong>1st</strong></td>
<td>Warm water cooled supercomputer</td>
<td>Delivered world’s first warm water cooled Supercomputer; LRZ Delivers 35% less OPEX than air-cooled systems. Source: LRZ Case study</td>
</tr>
<tr>
<td><strong>1st</strong></td>
<td>Delivered World’s largest Supercomputer for Astrophysics</td>
<td>Helped understand implication of black hole phenomenon to our world. Source: COSMA Supercomputer at Durham, UK.</td>
</tr>
<tr>
<td><strong>1st</strong></td>
<td>Largest HPC vendor in China</td>
<td>52% greater than #2 Sugon. Source: <a href="https://www.top500.org/">https://www.top500.org/</a> (as of June 2017)</td>
</tr>
<tr>
<td><strong>1st</strong></td>
<td>Delivered most Supercomputers in Germany</td>
<td>More than Cray, 4X more than HPE. Source: Top500 November 2016. Lenovo: 8, Cray: 7, HPE: 2.</td>
</tr>
<tr>
<td><strong>1st</strong></td>
<td>Delivered largest AI training cluster in Australia</td>
<td>University of Adelaide. Source: Lenovo and University of Adelaide Case Study</td>
</tr>
<tr>
<td><strong>1st</strong></td>
<td>Delivered largest water cooled Supercomputer in Asia</td>
<td>Metrological Malaysia. Source – publication pending</td>
</tr>
</tbody>
</table>
XClarity Simplifies Installation and Configuration Tasks

For installation and configuration tasks than performing them manually. Principled Technologies test report Faster and More Efficient System Management with Lenovo XClarity Administrator.

For installation and configuration tasks using XClarity vs. Cisco UCS Manager. Principled Technologies test report Faster and More Efficient System Management with Lenovo XClarity Administrator vs. Cisco UCS Manager.

For installation and configuration tasks using XClarity vs. HPE ONEVIEW. Principled Technologies test report Faster and More Efficient Flex System Management with Lenovo XClarity Administrator vs. HP OneView.


For firmware update tasks using XClarity vs. HP ONEVIEW. Principled Technologies test report Faster and More Efficient Flex System Management with Lenovo XClarity Administrator vs. HP OneView.