



Dell Solutions in Healthcare

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DELLTechnologies

Digital Transformation Is Disrupting Every Industry

50%+

of global GDP will be digitized by 2021¹

48%

are unsure what their industry will look like in 3 years

45%

fear they will be obsolete in 3-5 years²

92%

see digital business initiatives as critical²

AUTOMOTIVE

RETAIL

MANUFACTURING

SCIENCES

FINANCE

AND MORE...

¹ IDC FutureScape: Worldwide IT Industry 2018 Predictions Oct 2017 -- Doc # US43171317

² Dell Digital Transformation Index

Evolving Data Landscape

TRADITIONAL



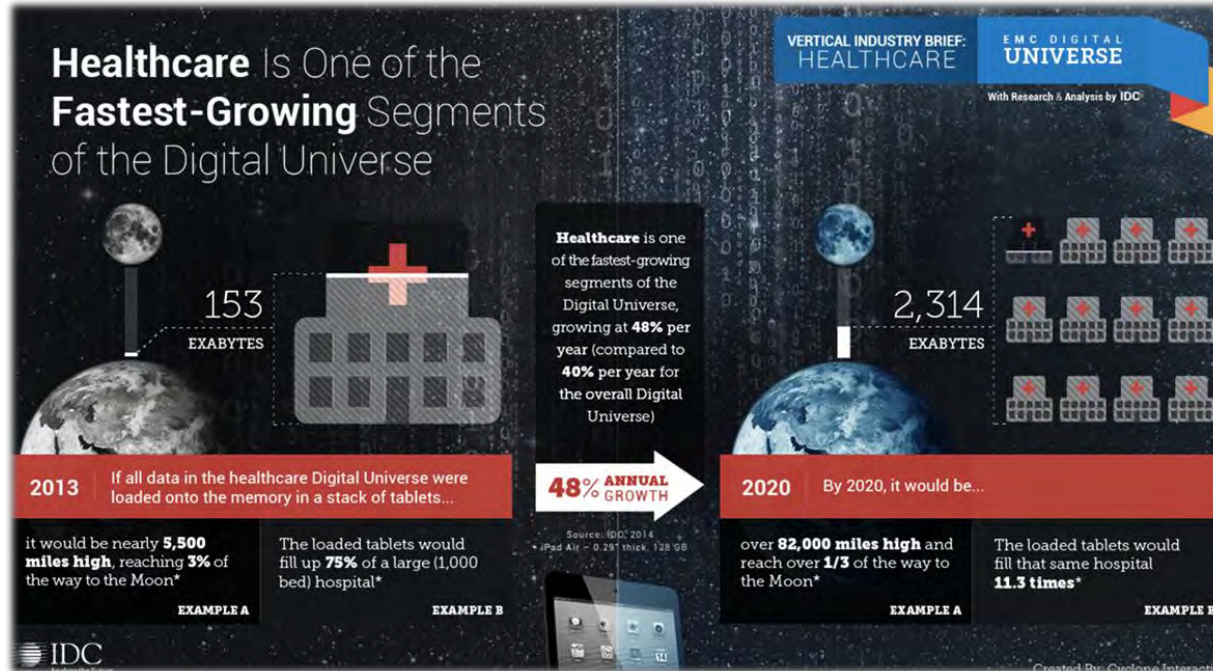
Structured Linear Growth
Contained Batch

NOW



Unstructured Exponential Growth
Distributed Real-time

Healthcare Data: World Record in Data Growth

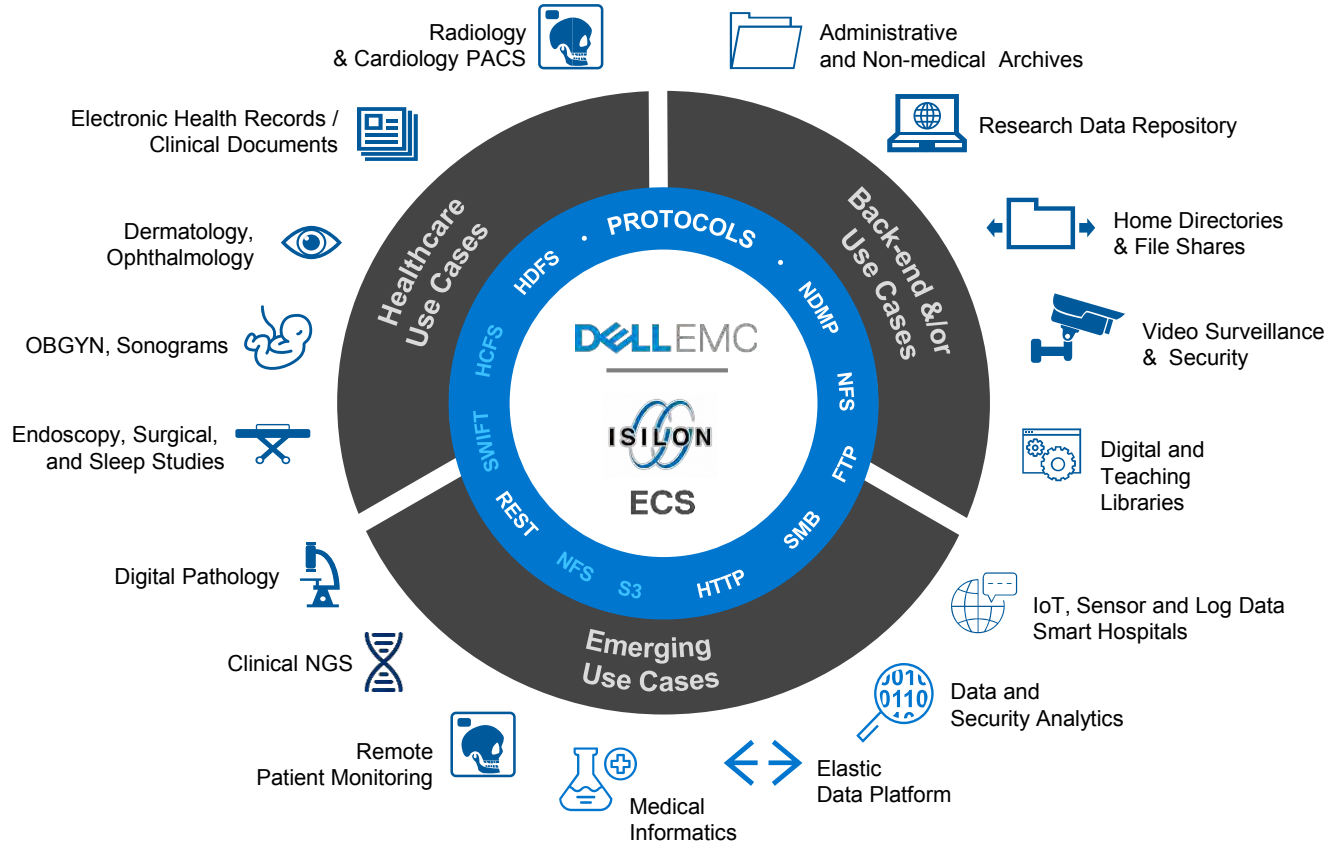


Industry Drivers:

- Clinical applications
- Compliance Requirements
 - HITECH, EMR MU
 - HIPAA, EU Data Directives
- FutureCare-enabling technologies for cloud, Big Data, mobile, & social
- Latest IDC number for 2020 and beyond: 35%

Source: IDC / EMC Digital Universe
Healthcare Industry Brief

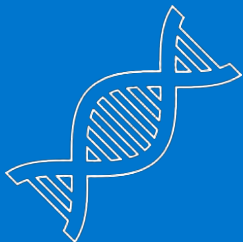
Data Sources in Healthcare and Life Sciences



Unstoppable data growth

Biological health information has grown to surpass our cognitive capacity, how will we manage and learn from this massive increase in data?

Genomic data
New volume growth



800MB - per genome

+300TB - 200 Cancer Genomes

+200TB – All known variants

Images
Medical image archive exponential growth



1GB 3D CT SCAN

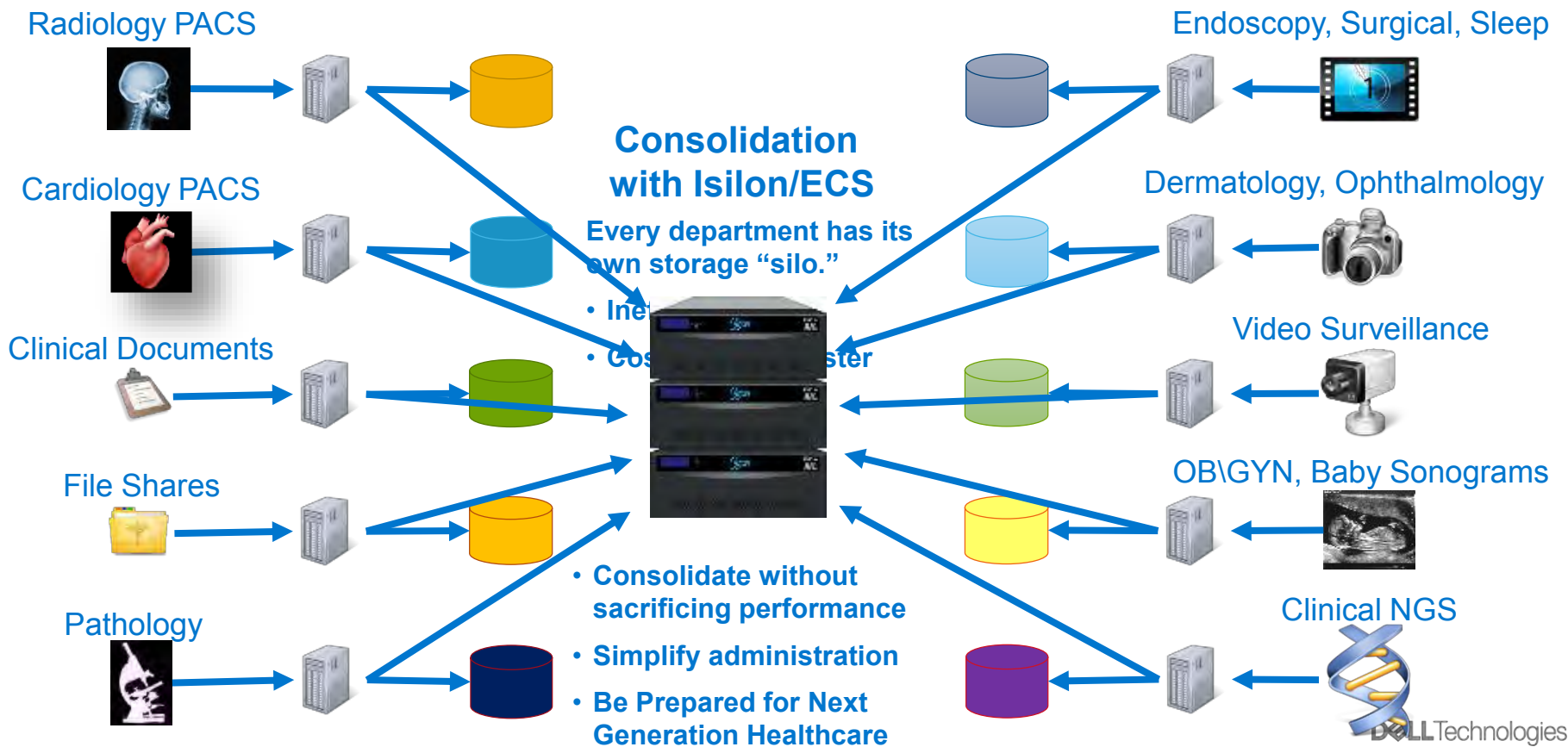
150MB MRI

3GB Digital Pathology

The Top 3 Focus Areas Around Healthcare Data

- IT Consolidation
 - Eliminate Data Silos
 - Create a “Healthcare Data Lake”, aka VNA (Vendor Neutral Archive)
 - Use Data for Clinical Outcomes, aka Precision Medicine
- Genomics Sequencing
 - Primarily in Oncology
 - Also used in Diabetes and Cardiology
- Digital Pathology
 - Last Discipline to Transform to a Digital Workflow
 - Huge Amount of Data to be Managed
 - Potential AI Projects with Medical Universities and Research Institutions

Typical Storage in a Hospital / HC Region



Dell EMC Healthcare Partner Ecosystem

Certified offers for healthcare providers worldwide

Clinical Applications and Offers



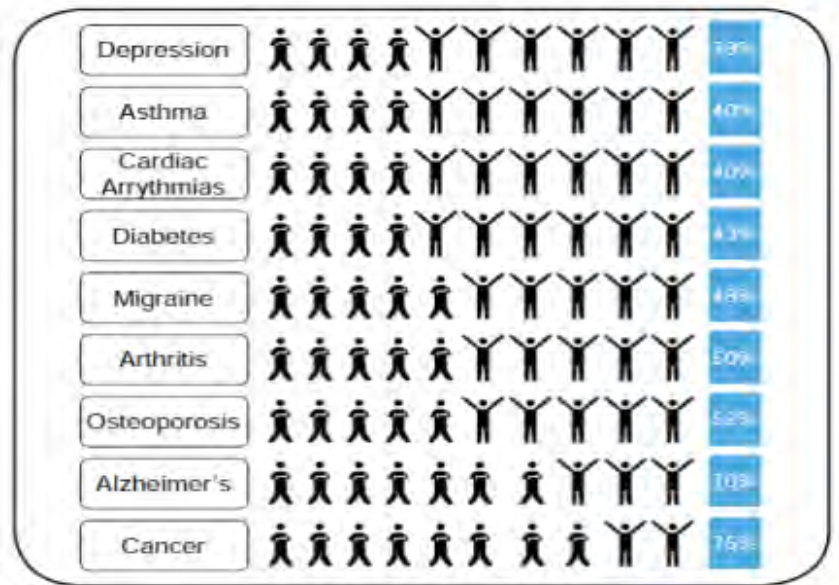
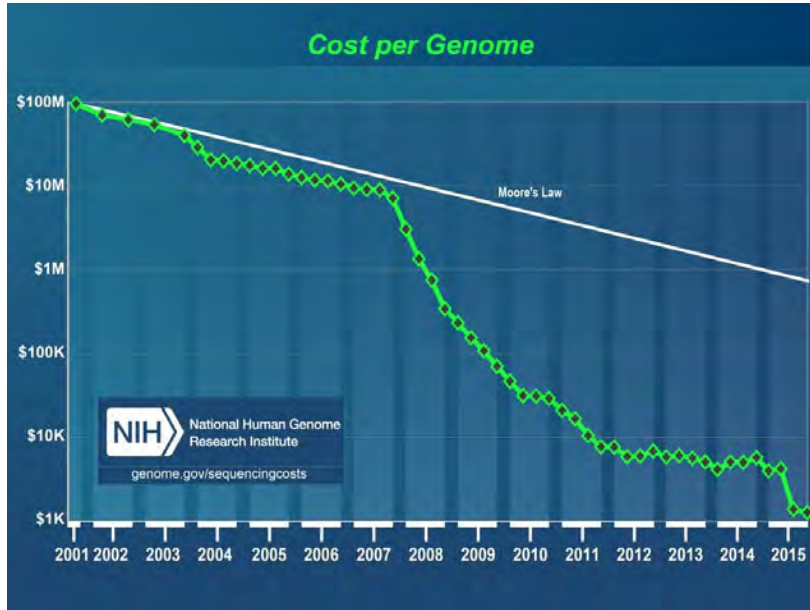
FutureCare
Partner
Ecosystem



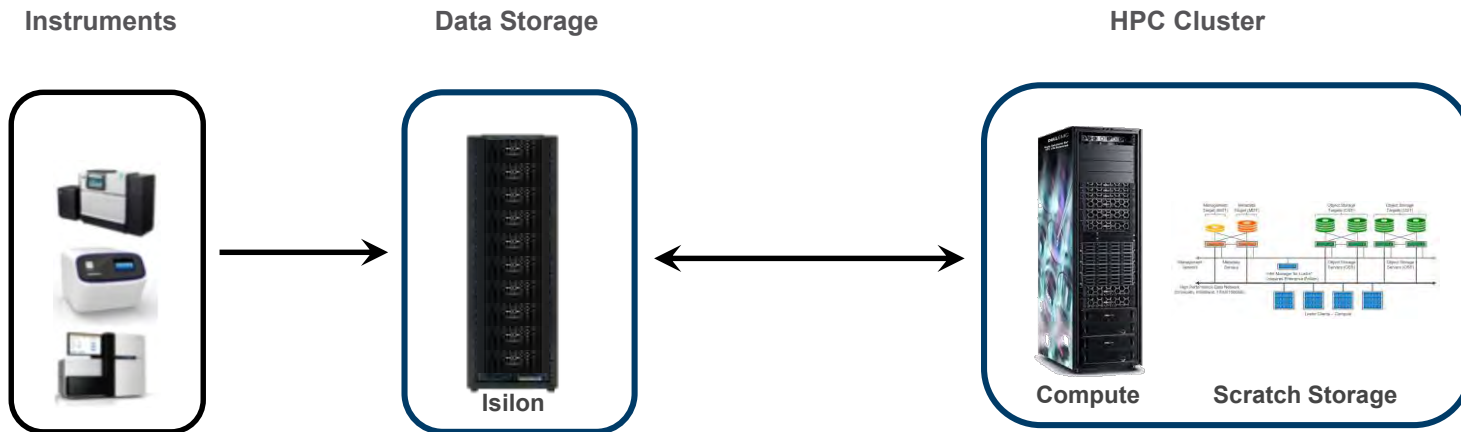
Alliances

Tech Partners

Why Next Gen Sequencing?

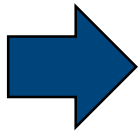




Main Components of the Hardware Infrastructure



Digital Pathology – the Next Digital Workflow

- Pathologists start adapting to the digital workflow
- ISVs start offering solutions for digital pathology
- Enormous amount of data
 - 4x500 MB per Whole Slide Image

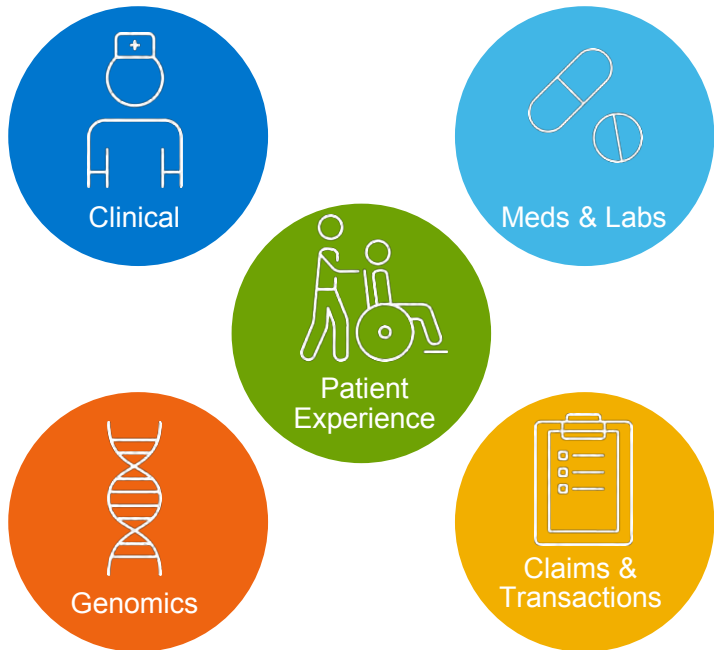


ISV	Scanner	PACS / workflow	AI / Analytics	FDA approved
 PROSCIA		✓	✓	
 HURON Digital Pathology	✓	✓	✓	
PHILIPS	✓	✓		✓
SECTRA		✓		✓
Leica	✓	✓		✓
inspirata		✓	✓	

Big data is the foundation of precision medicine

Today:

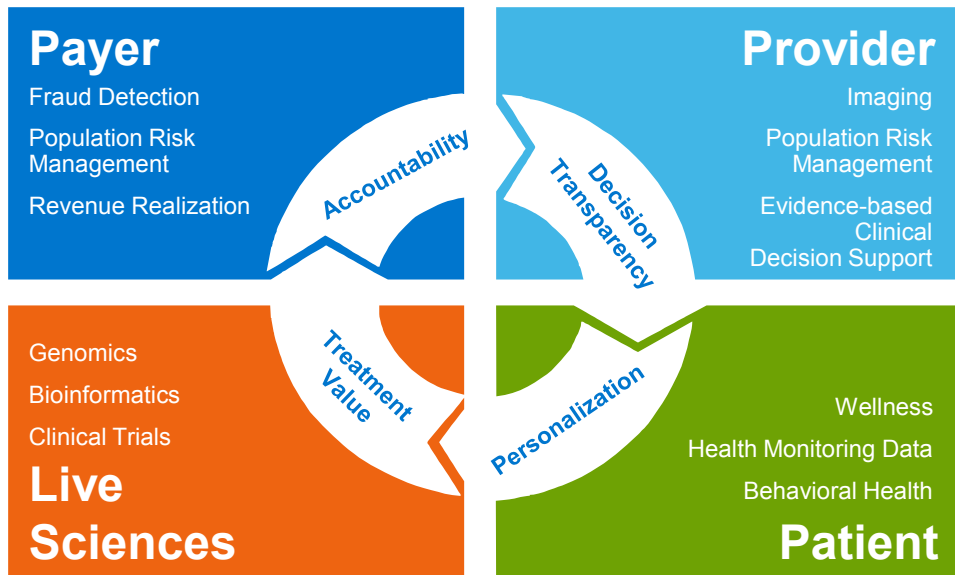
Many Disparate Data Types



Future:

Clinically Actionable Information

Leading to better decisions, improved patient experience, healthier population outcomes, & value-based care, higher quality at reduced costs



Precision Medicine Transformation

Big data and research platforms are key to unlocking the value in precision medicine



Acquire



**Clinical
Genomics/HPC**



Analyze



**Big Data and
Analytics**



Act



**Machine
Learning**

Machine Learning in Healthcare



Cancer detection

Diabetic grading

Chronic illness prediction

Drug discovery

Gene mutation

Aged care

Sanitation

Tools for Digital Pathology

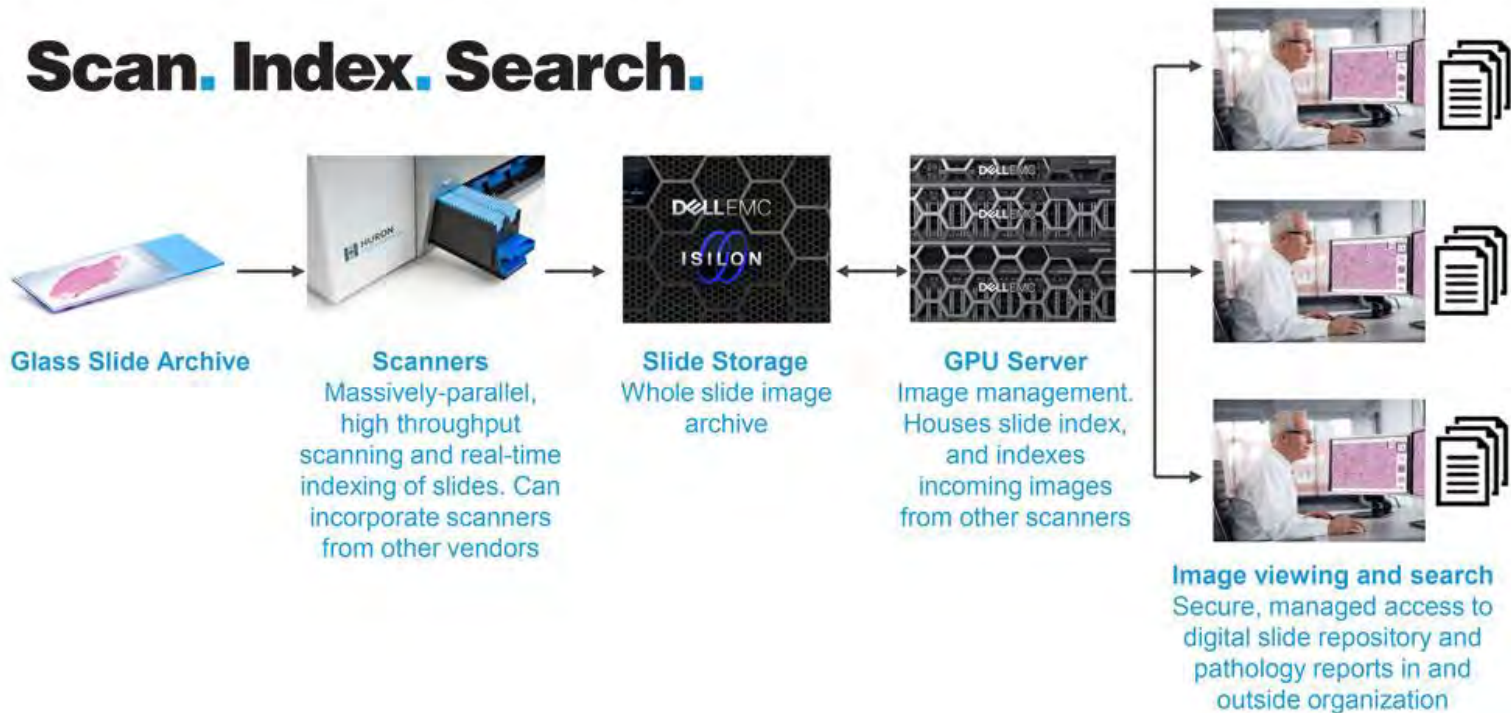
Emergency Call Center



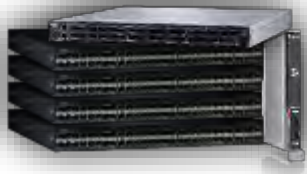
Huron Digital Pathology Analytics

<http://www.hurondigitalpathology.com/>

Scan. Index. Search.



Modern Data Center: Your End-to-End HIT Partner



Networking



Servers



Storage



Data Protection

Converged & Hyperconverged Infrastructure



Ready Solution for Life Sciences



Ready Solution for Artificial Intelligence



Challenges handling unstructured data

QUANTITY

80%

of the world's data
is unstructured¹

GROWTH

3x

Expected to triple
from 2019 to 2024²

LOCALITY

50%

Outside
data center

All while IT budgets remain flat

¹ Source: Gartner Market Guide for File Analysis Software March 2018

² Source: Gartner ("From 2019-2024, enterprises will **triple** their unstructured data stored as file or object storage.")

³ Source: Gartner ("By 2022, more than 50% of enterprise-generated data will be created and processed outside the data center or cloud, up from less than 10% in 2019")

How do you tackle these challenges?

QUANTITY



Massive scale with
a single platform

GROWTH



Data growth
without complexity

LOCALITY



Diverse workloads from
edge to cloud

Strength in the unstructured market

Building on a proven history of innovation with Dell EMC Isilon and OneFS



#1

Scale-out NAS platform

Over 17+
exabytes in the field

Gartner

**Magic Quadrant
Leader**

4 years in a row



2,000+

Media and
entertainment

18 of 20

Top hospitals
in U.S.

Leadership in over 22 verticals

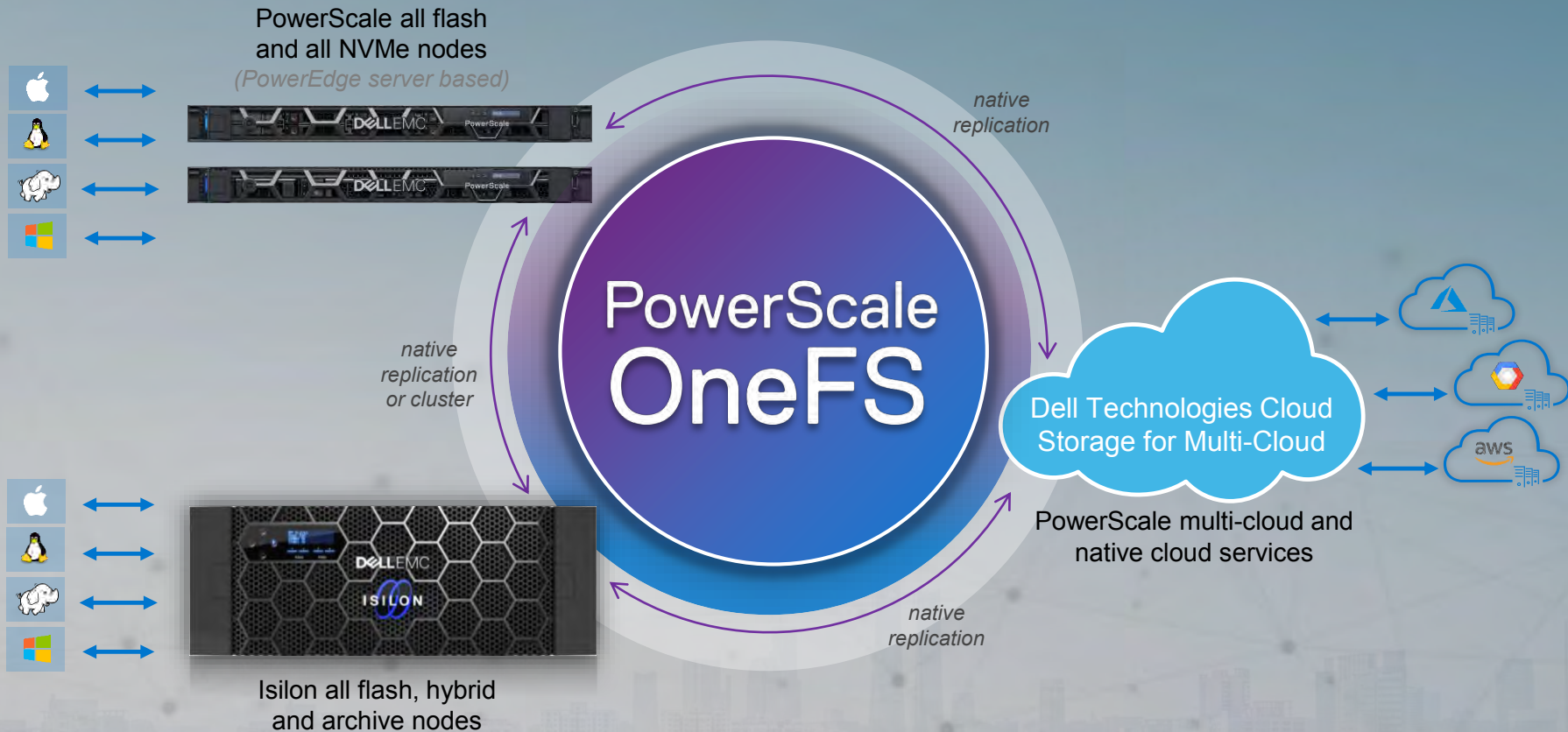
8 of 10

Top U.S. based
pharmaceutical
companies

Over 70%

Driver assist &
autonomous
vehicle suppliers

Introducing PowerScale family



PowerScale family platforms



Archive



Isilon A200 | A2000

Hybrid



Isilon H600



Isilon H500 | H5600



Isilon H400

All-Flash



Isilon F800 | F810



PowerScale F600



PowerScale F200

PowerScale
OneFS

Combine in a single cluster with PowerScale OneFS

Enterprise grade data protection & management

Data protection and security



SnapshotIQ

Fast, efficient data backup and recovery



SyncIQ

Fast and flexible asynchronous replication for disaster recovery protection



SmartConnect

Policy-based client failover with load balancing



SmartLock

Policy-based compliance and WORM data protection



SmartDedupe

Data deduplication to reduce storage requirements and costs

Data management



SmartPools

Policy-based automated tiering



CloudPools

Seamlessly tier cold or frozen data to a choice of public or private cloud options



Access Zones

Secure separation of data for different groups or users



SmartQuotas

Quota management and thin provisioning



InsightIQ

Performance monitoring and reporting to manage storage resources

ECS Scale-Out Object Store

Modern archive

Universal archive for existing primary storage. Replaces tape. No changes to applications or operations. Archive always online of analytics workflows

Cloud native

Enable new healthcare business operations. Cloud economics and ease of use on-premise. Lower TCO compared to public cloud providers

Scalability

Deployable in clusters for petabyte and exabyte scalability

Data protection

Provides geo-distributed data protection with no single point of failure. Globally accessible. One namespace. Multi-tenant architecture

Accelerate cloud native applications

Future healthcare IoT applications on private infrastructure

Operational flexibility

Multi-protocol support for legacy & modern applications



ECS platform family

Optional SSD cache available for
all archive platforms – up to **75%**
performance improvement

Standard

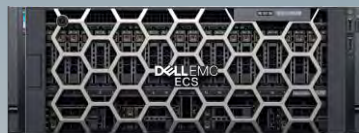


ECS EX500



ECS EX300

Deep



ECS EX3000

PowerEdge-based servers
across the ECS portfolio

Now with 16TB HDD!

ECS

*Names and images are representational and not finalized

ECS platform family

Archive

EX300



- PowerEdge server based entry platform starting at 60TB for a 5-node cluster
- Ideal for cloud-native, mobile, and web apps
- Optional 960GB **SSD** cache - up to 66% performance improvement¹
- 1TB, 2TB, 4TB, 8TB and new **16TB** drive options (12 or 24 drives per node)

EX500



- PowerEdge server based platform offering blend of economy and performance
- Improved performance with dual 10-core processors
- Optional 960GB **SSD** cache - up to 55% performance improvement¹
- 8TB, 12TB and new **16TB** drive options (12 or 24 drives per node)

EX3000



- Purpose-built appliance offering best density with up to 11.5PB per rack
- Ideal for storage and long term retention of bulk data
- Optional 960GB **SSD** cache - up to 75% performance improvement¹
- 12TB and new **16TB** drive options (30, 45, 60 or 90 drives per node)

¹10KB object size

Dell EMC HPC System for Life Sciences

For Pharma/biotech applications

Solution benefits

- Reduces time to results from days to hours
- Compatible with extensive genomics application ecosystem
- Optimized for performance, density and efficiency
- Throughput — up to 163 10x genomes per day¹
- Energy efficiency — less than 8.22 kWh/genome power consumption¹

Dell EMC differentiation

- Dell EMC Engineering tested, validated, and tuned for specific life sciences application sets
- Customers can leverage Dell EMC relationship for benchmarking, best practices and lab tours
- Dell EMC can provide worldwide financing, fulfillment and single-call support

Flexible design scales with plug and play building blocks to keep up with fast growing pharma/biotech applications.



BioBuilds open source distribution from Lab7™



Dell EMC PowerEdge™ R430, R630 servers, FC430, C4130, C6320 servers



Dell EMC HPC Storage for Intel® Lustre® and Dell EMC Isilon for Persistent Storage

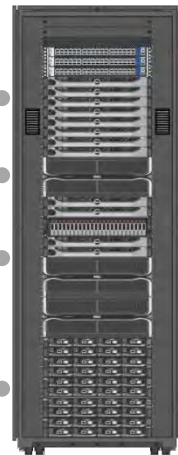
Dell EMC Networking S3048-ON Management fabric, Mellanox® SX6036 InfiniBand® high-speed fabric; Intel Omni-Path fabric in Dell EMC H-Series H1000 and H9000 series



Simplified management using Bright Cluster Manager and Dell EMC iDRAC

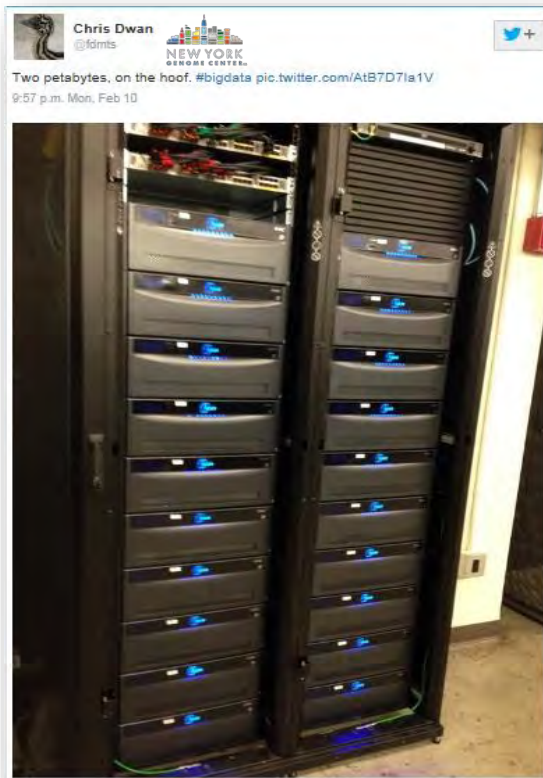


Nvidia GPUs for accelerated workloads



¹[Dell HPC System for Genomics v2.0 Reference Architecture](#)

Dell EMC Isilon Life Sciences By The Numbers



- Focused On Life Science Organizations Since 2008
- Used by 300+ Organizations For NGS, HPC And Research Archive Workloads
- Installed At:
 - 8 Of The Top 10 Global Pharmaceutical Companies
 - 40% Of Top 100 North America Academic Medical Centers
 - 11 NIH Research Centers
 - Used at 7 Illumina HiSeq X Ten Installations
- **1+ EB Isilon installed in Genomics worldwide**

Continued Commitment to Life Science Industry Initiatives and Technologies



Global Alliance
for Genomics & Health

iRODS
CONSORTIUM



The logo for Dell Technologies, featuring the word "DELL" in a bold, sans-serif font with a stylized "E" composed of three horizontal bars, followed by the word "Technologies" in a smaller, lowercase, sans-serif font.