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The Future is Now

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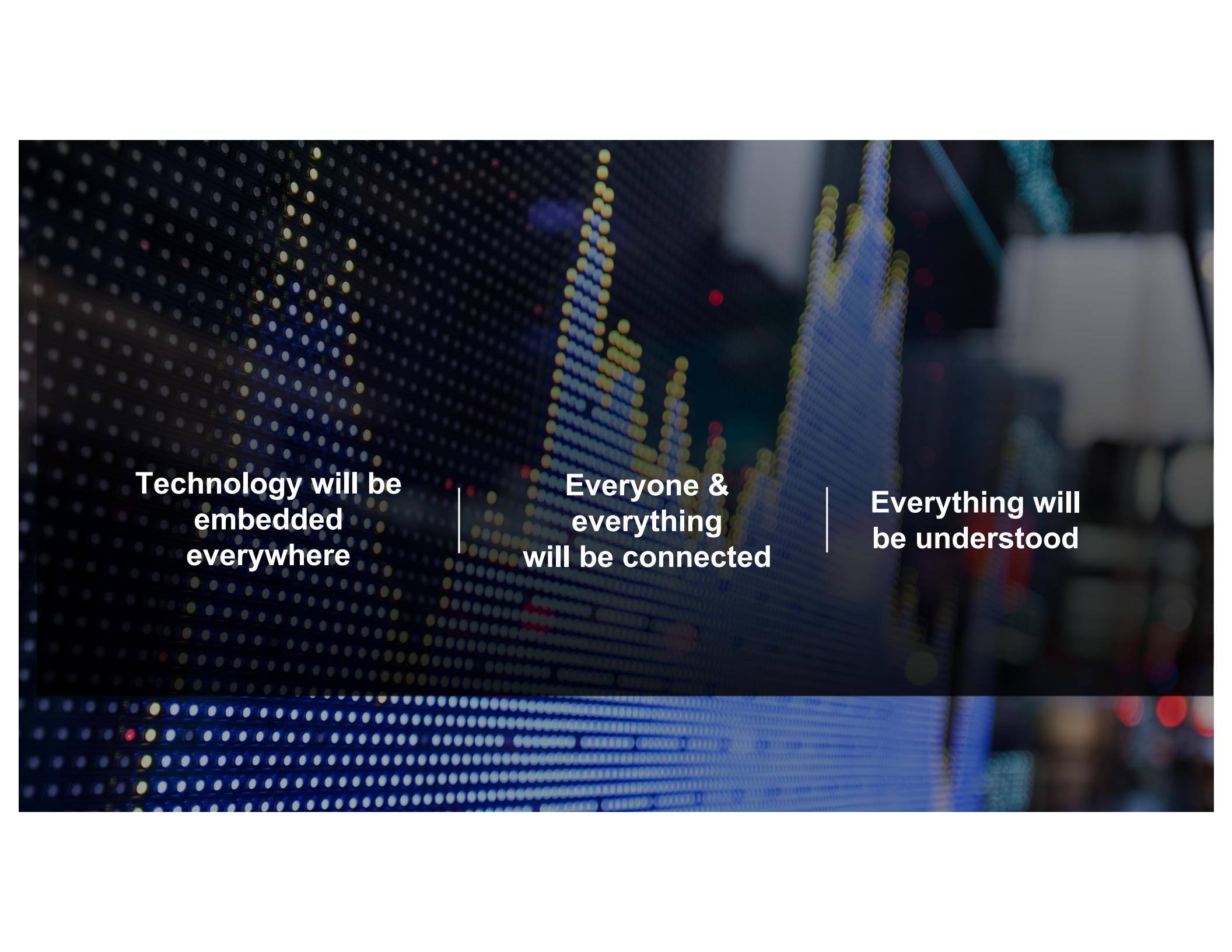Storage

September 2017

Prepare for an expanding ecosystem

IDC predicts that the amount of data will reach **40** zettabytes by 2020, and more than **163** zettabytes a year by 2025.

*Source: IDC Digital Universe study

Technology will be embedded everywhere

Everyone & everything will be connected

Everything will be understood

Digital transformation is disrupting <u>every industry</u>

Transformed

Newspapers & magazines → Digital media

Books → eBooks

Music & video → Downloads & streaming

Retail → Online shopping

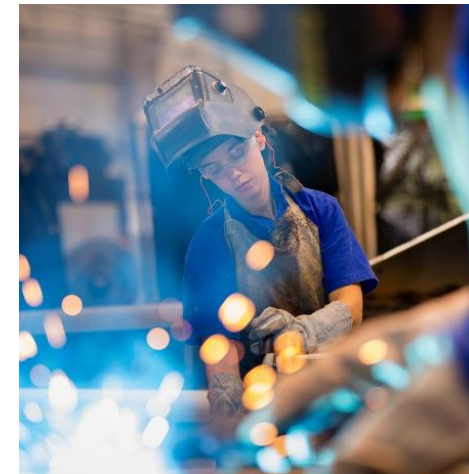**Travel** → Online travel agents and DIY

Transforming

Wellness & healthcare → eDoctors

Retail banking → Online banking/apps

Transportation → Digital communication for 'smart' connected transport

Government → Closing the gap between the citizen and the state

Soon to be transformed

Manufacturing	**Legal**
Insurance	**Education**
Utilities	**Construction**

Accelerating time to value is key to success in a hybrid world

Flexible consumption

Driven by agile DevOps

Ecosystem of innovation partners

Hybrid IT

Security & resilience built-in

Containerized, automated and orchestrated

Always workload optimized

Your Apps & Data

Mobile users, apps and devices

Beacons, sensors and geo-positioning

Reliable performance & experience

Intelligent Edge

Ubiquitous connectivity

Adaptive trust security

Built-in data analysis & contextually aware

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With more data presented at the Edge than ever before

Long-term data <u>management</u> and <u>protection</u> of digital assets is key

Operations Technology (OT)

Information Technology (IT)

The Edge

Data generating devices

> Wearables
> Cars
> Motors
> Buildings

> Mobile devices
> Meters
> Robotics
> Generators

Data sensing using sensors & actuators

Data Aggregation & Gateways

Early data analytics using Edge IT

Deep data analytics using Data Center And Cloud IT
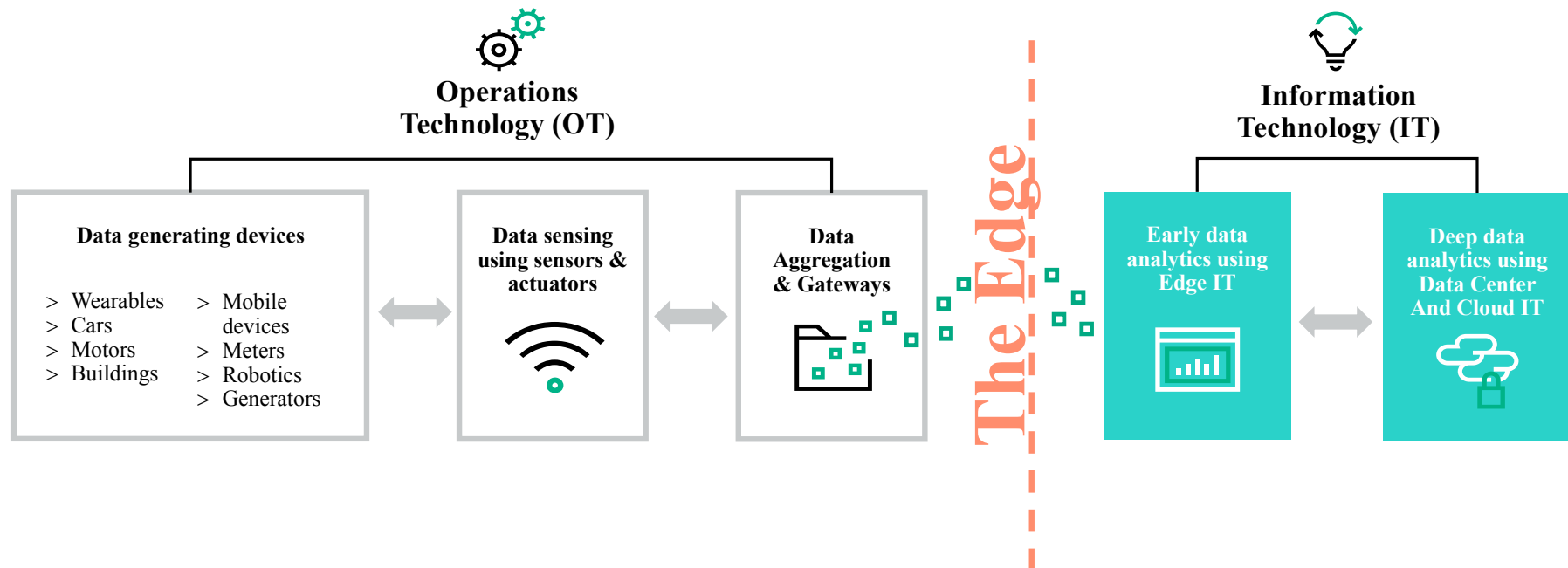
>5.6 billion IoT devices owned by Enterprises and Governments will utilize edge computing for data collection and processing by 2020*.

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Addressing market trends

Major market trends

Move Towards a Hybrid Cloud Model	Accelerated Flash Storage Growth	Increased Use for Server Based Storage	Support for Future Storage Technologies

Flash
> Flash continues to disrupt the storage market as cost of flash media continues to decline and capacity points increase
> Entering third wave of disruption where All Flash is the "new normal" for mission critical workloads
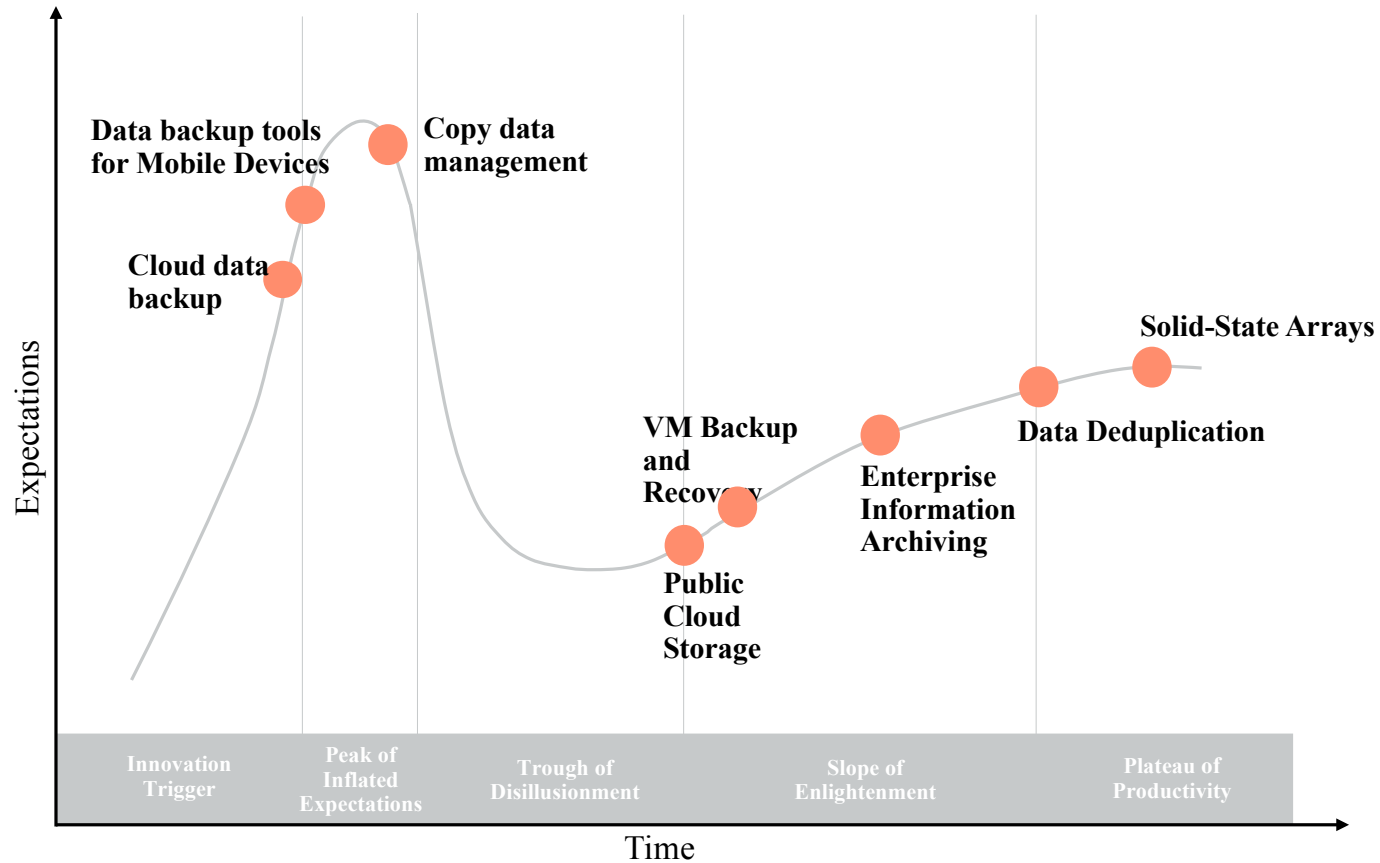> All Flash Array (AFA) market generated over $1.1BN in Q3'16

Cloud
> Public cloud storage continues to grow (but with some concerns)
> Hybrid Cloud strategies become more popular to combat security, data sovereignty and bandwidth pricing issues
> Increased popularity around pay-as-you-grow storage consumption models

Object
> Software Defined Storage (SDS) is becoming an integral part of big-data and HPC initiatives
> Optimal data storage economics at scale with less footprint
> Timeless flexibility today and for the future

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And so many forms of data protection to choose from

Expectations vs Time — An interpretation of the Gartner 2017 Storage Hype Cycle

- Cloud data backup
- Data backup tools for Mobile Devices
- Copy data management
- Public Cloud Storage
- VM Backup and Recovery
- Enterprise Information Archiving
- Data Deduplication
- Solid-State Arrays

Innovation Trigger — Peak of Inflated Expectations — Trough of Disillusionment — Slope of Enlightenment — Plateau of Productivity

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And in an evolving storage landscape
what role does tape still have to play?

Intelligent Edge and Hybrid IT challenges

Transitioning to the Intelligent Edge and Hybrid IT comes with its own challenges

Intelligent Edge challenges	Hybrid IT challenges
– Provide **secure access** for users, devices and things	– Legacy data and IT requirements consume >60% of resources
– **Manage demands** of remote and branch locations	– **Cumbersome** culture, tools and processes
– **Personalize customer engagement** for increased loyalty	– **Complex** industry requirements
– Harness **value of insights** generated from mobility and IoT	– Annual fixed funding models and **shrinking budgets**
	– **Security** and governance risk

Tape continues to provide the <u>lowest-cost, most reliable, secure storage solution for long-term retention</u> of digital assets at $0.007 per GB* for life

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Protect your Data and Applications with Enterprise Tape Technology

Economic
Lowest cost storage at $0.007 per GB for life[1]

Efficient
Tape energy consumption <2% of equivalent storage using HDDs[2]

Highly scalable
Current LTO-7 cartridge holds up to 15TB[3]. LTO-8 ~30TB.

Secure
Offline and on-premises protection against ransomware

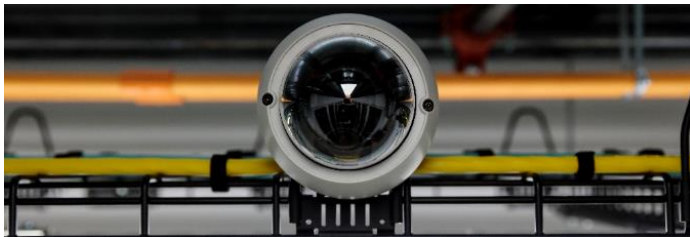# Tape's value proposition is still as relevant today as it has ever been

[1] Assumes 2.5:1 compression ratio for the life of the cartridge. Based on current audit of LTO-7 pricing (Mar'17) at $115.55 per 15TB
[2] State of the Tape Industry 2017
[3] 2.5:1 compression ratio

# New areas of growth for tape technology

Digital video surveillance

> In 2017, an estimated **127 million** video surveillance cameras will be sold[1].
> Factors driving worldwide demand include:
>> - Increased awareness
>> - Security climate
>> - Legislation
>> - Multiple use
>> - Price decreases

HPC & Big Data Analytics (HPDA)

> Moving from static searches in databases to complex algorithms and analysis to discover hidden patterns, relationships and trends.
> Offload cold storage from primary arrays to tape libraries for long-term retention.
> High capacity tape libraries, with low power consumption ideal for supporting HPC environments over the long-term.
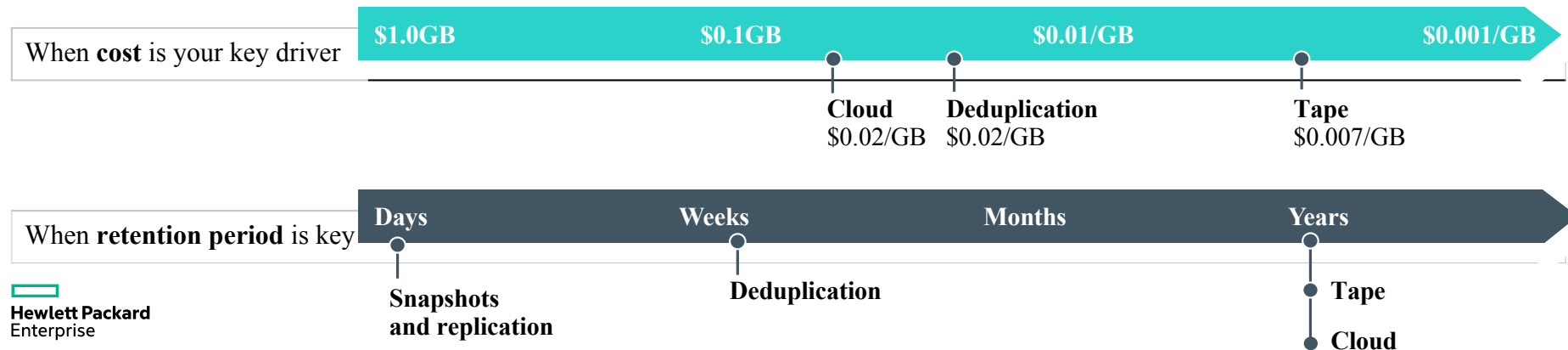
Protection against Ransomware
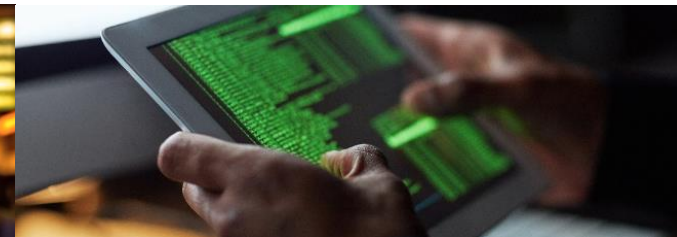
> Cyberattacks can occcur at any time – make sure your business is prepared!
> 6 ways to fight back
>> **1.** Data inventory
>> **2.** Staff training
>> **3.** Preparation
>> **4.** Offline data (create an air-gap)
>> **5.** Out of region data
>> **6.** Backup and recovery

[1] *IHS Markit Technology – Video Surveillance Intelligence Service – Dec. 2016*

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Hot topic discussion: Tape vs. Cloud for long-term retention?

TCO factors you should consider

Cost factors	Tape	Cloud storage
Raw storage capacity in a remote location	Relatively low-cost	Cost varies
On-premises backup infrastructure (SW/HW)	Costs can be significantly reduced when using tape	System costs and separate management processes are required
Off-site DR of backup data	Media transport, facility rental and media management	High bandwidth link
Long-term retention	Tape saves storage costs	Cloud storage, data transport and access or e-delivery
Admin and processes	More labor intensive and prone to human error	More automated and less labor intensive

When **cost** is your key driver

$1.0GB $0.1GB $0.01/GB $0.001/GB

Cloud   Deduplication   Tape
$0.02/GB $0.02/GB $0.007/GB

When **retention period** is key

Days   Weeks   Months   Years

Snapshots   Deduplication   Tape
and replication
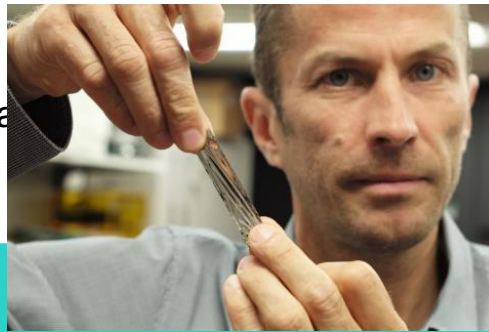   Cloud

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The future looks bright for tape storage
Developments for tape storage on the horizon

Patent activity remains high
> Higher performance
> Reduced times to first byte of data
> Increased reliability
> Availability advancements

Dr. Mark Lantz with 330TB uncompressed data on new one square inch sputtered tape.
IBM Research

New use cases and innovative solutions
> Active Archives
> Storage tiering
> Tape for Cloud and Internet Providers
> Video surveillance and cybersecurity

Tape roadmaps
> LTO Program TPC identify LTO-10 generation on current roadmap
> INSIC (2015-2025) International Magnetic Tape Storage Roadmap indicate the current areal density scaling rate will increase the cost advantage significantly between HDD's and tape systems.

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Thank You!

Any questions?