Spectra Logic – Future of Tape

Nick Westcott

Enterprise Sales Representative Aus/NZ
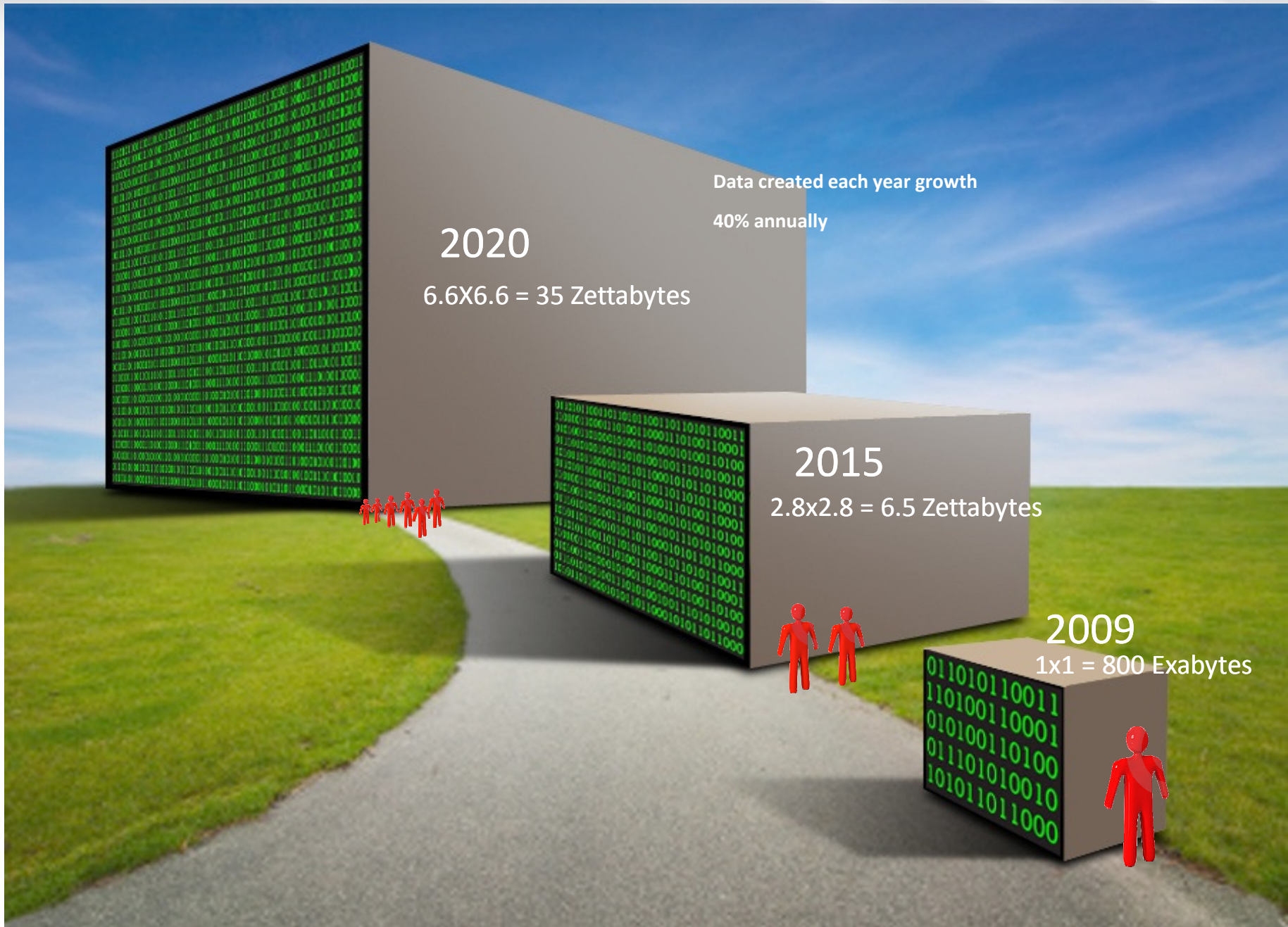
DEEP STORAGE EXPERTS

Data Growth

2020
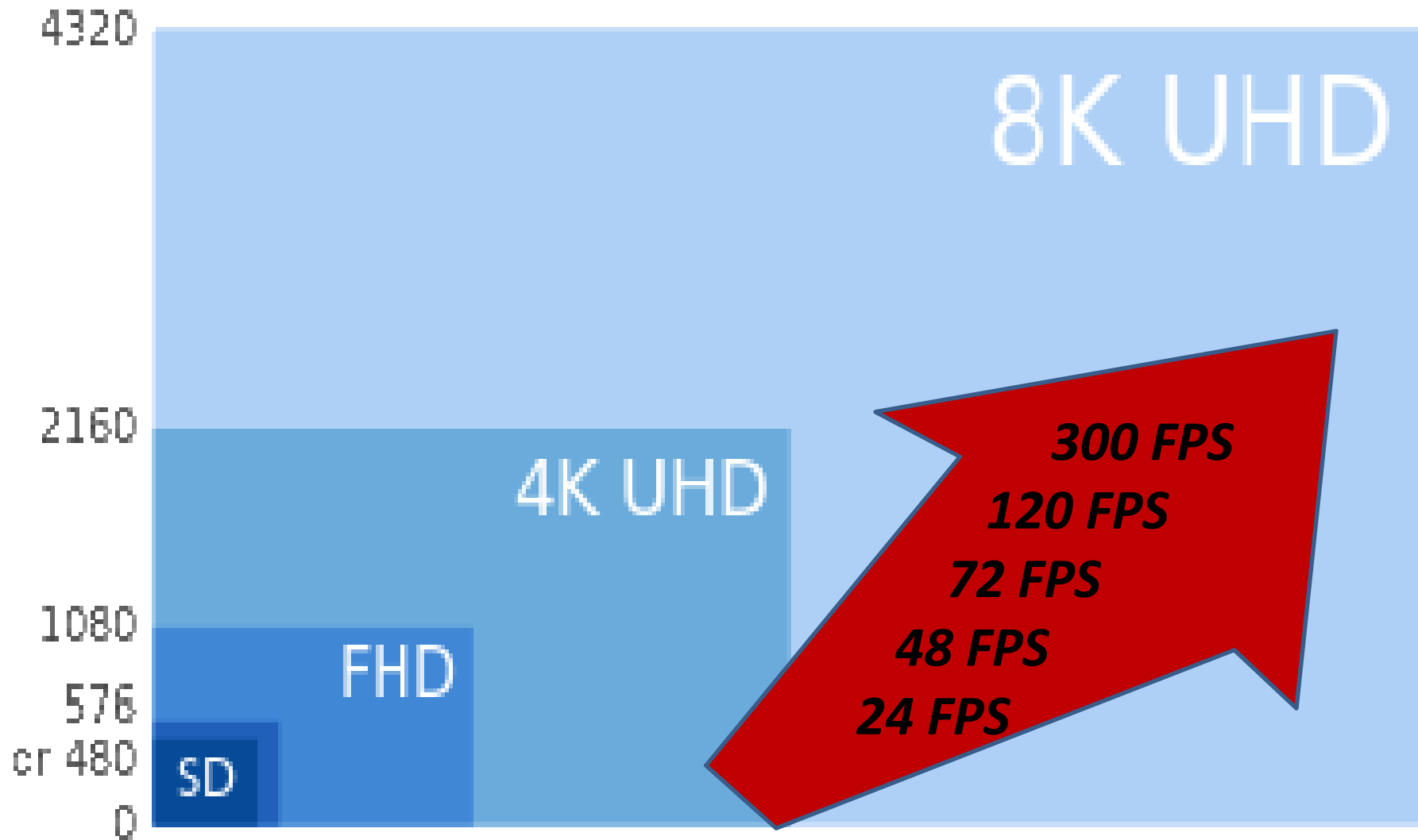6.6X6.6 = 35 Zettabytes

Data created each year growth
40% annually

2015
2.8x2.8 = 6.5 Zettabytes

2009
1x1 = 800 Exabytes

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Genomics

6 Cows = 1TB data

University of Washington, St. Louis

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What Happens in an
Internet Minute?
1,572,877 GB of global IP data transferred[1]

10 Million ads displayed[2]

347,222 Tweets[3]

3.3 Million pieces of content shared[4]

6.9 Million messages sent[4]

Netflix + Youtube = **more than ½ of all traffic**[5]

$400 Million during Alibaba peak day sales[6]

438,801 Wiki page views[7]

10 Million WeChat messages at its peak[9]

34.7 Million instant messages (MIM) sent[8]

194,064 app downloads[10]

$133,436 in sales[11]

31,773 hours of music played[12]

38,194 photos uploaded[13]

57,870 page views[14]

4.1 Million searches[15]

100 hours of video uploaded[16]

138,889 hours of video watched[16]

23,148 hours of video watched[17]

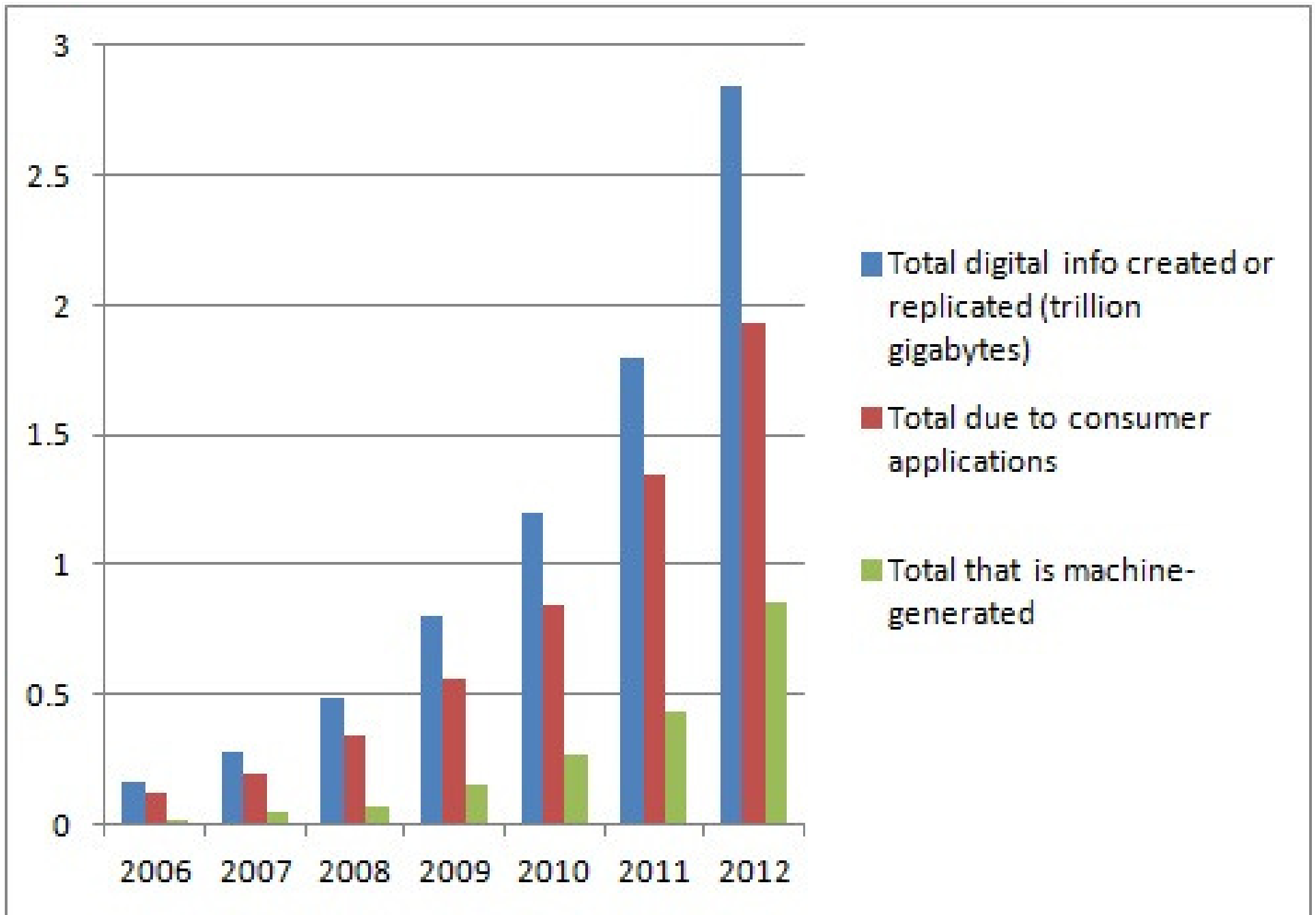**And Future Growth is Staggering**

By 2017, mobile traffic will have grown **13X** in just 5 years[1]
2012 2017

In 2017, there will be **3X** more connected devices than people on Earth[1]

All digital data created reached **4 zettabytes** in 2013[18]

Source: Intel

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Digital System and their growth

- A $1000 Genome scan take 780 MB fully compressed

- A 2011 HiSeq-2000 sequencer generate 20TB per month

- A typical security camera - 105GB of data per day.
  - 500,000 Cameras in Greater London

- A digital camera is now 12MP or better

- A 4K video consumes 4.25 TB per hour

- Geospatial
  - An average ingest of 5 TB a day of new imagery.
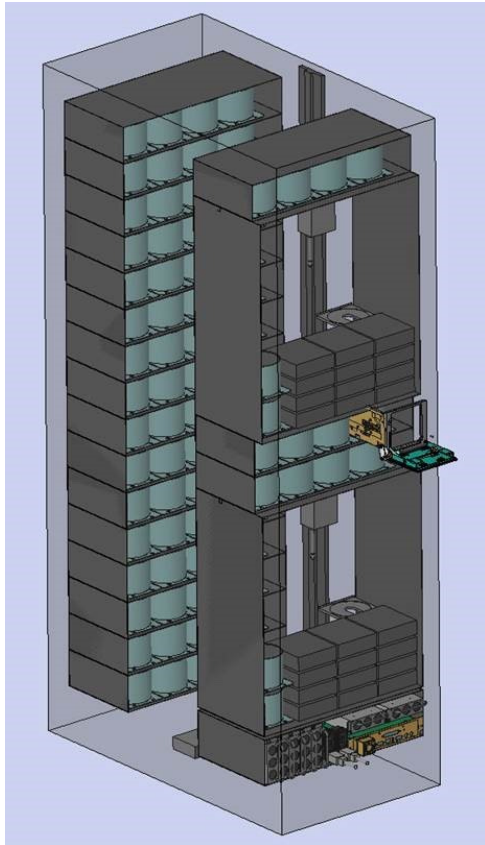 - 80 TB a day of refined product produced.

WHERE ARE WE GOING TO PUT ALL OF THIS DATA...

Let's Look At Archive Disk Optical Media

Spectra 15,000 Disk Robot Design   **Strengths / Weaknesses**

- Derivative of BluRay & DVD
  - Developed by Sony & Panasonic
  - Write once, 50 year media life
  - Roadmap: 300GB (2016), 500GB (2019), 1TB (unknown)
- Unknowns
  - Corrected error rates
  - Media format interchange between drives
  - Optical drive longevity (may be a consumer grade design)
  - Media costs (needs to be $3 per disk to compete)
  - Handling risks
  - Market acceptance
- Currently on hold at Spectra due to uncertainty

Disk Short Term Road Map (SMR)

- Today Enterprise drives are at 10TB and SMR drives are at 8TB.

- It's true that the disk physics have nearly reached the super paramagnetic limits using perpendicular recording. But....

- By tweaking the track pitch, adding a 7th platter and making the shingle recording a little more efficient (35-40% vs. 20-25%) you could get to 16TB...maybe 20TB

- Beyond that you need HAMR or Bit Patterned Media

- Our guess is that in 2016 we will see 12TB drives

Spectra Continues To Develop The World's Largest Capacity Tape Libraries

TS1150 => 1 Exabyte in a single library
LTO7 => 750 PB in a single library

- Tape Is A Growth Market For Spectra
  - Continued library innovation and commitment to R&D
  - Increasing reliability and performance

LTO-7 in TSeries

Tseries Library	Max Slots	Uncompressed Capacity (TB)	Compressed Capacity (TB)	Max Drives	Uncompressed Data Rate (TB/Hr)	Compressed Data Rate (TB/Hr)
T50e	50	300	750	4	4.3	10.8
T120	120	720	1,800	10	10.8	27.0
T200	200	1,200	3,000	8	8.6	21.6
T380	380	2,280	5,700	12	13.0	32.4
T680	670	4,020	10,050	12	13.0	32.4
T950	10,020	60,120	150,300	120	129.6	324.0
TFinity	50,100	300,600	751,500	120	129.6	324.0

LTO-7 Specifications (FC FH Drives)

Feature	Metric
Capacity (uncompressed)	6.0 TB
Capacity (compressed 2.5:1)	15.0 TB
Data Rate (uncompressed)	300 MB/s
Data Rate (compressed 2.5:1)	750 MB/s
Speed Matching	14 speeds
Average Rewind Time	40 seconds
Time to load / thread / initialize	12 seconds
Time to unload	17 seconds
Read Compatibility	LTO-5 and LTO-6
Write Compatibility	LTO-6
Power Consumption (Idle)	10 watts
Power Consumption (Read / Write	30 watts
MTBF	250,000 hours
Load / Unload Life	300,000 cycles
Bit Error Rate	1×10^{-19}

TS1150 Technology Drive and Spectra Libraries

T380 TS1150

DBAs	Slots	TB native	# of Drives	TB/Hr Native
3	153	1,530	12	15.6
2	207	2,070	8	10.4
1	261	2,610	4	5.2

T380 – the only rackmount library with TS1150 Technology

T950 TS1150
Base Frame

DBAs	Slots	TB native	# of Drives	TB/Hr Native
6	594	5,940	24	31.1
3	684	6,840	12	15.6
1	738	7,380	4	5.2

TFinity TS1150
Three Frame

DBAs	Slots	TB native	# of Drives	TB/Hr Native
6	1,350	13,500	24	31.1

TS11x0 Technology Roadmap

- Industry leading roadmap
  - ✓ Always superior to LTO
  - ✓ Exceeds T10000 D at TS1150

Characteristic	TS1140 (Gen 4) Previous	TS1150 (Gen 5) Current	TS1160 (Gen 6) TBD
Native Capacity	4 TB	10 TB	2x Gen 5 (Projected)
Native Data Rate (MB/S)	250	360	2x Gen 5 (Projected)
Partitioning / LTFS Support	Yes	Yes	Yes
Encryption	Yes	Yes	Yes

Statement of direction only. Subject to change by IBM without notice.

Characteristic	LTO6 Previous	LTO7 Current	LTO8 2018	LTO9 2021	LTO10 2024
Native Capacity	2.5 TB	6.0 TB	12.8 TB	25 TB	48-50 TB
Native Data Rate	160 MB/s	300 MB/s	472 MB/s	708 Mb/s	1100 MB/s

LTO Consortium roadmap – public.

# TeraPack Architecture

Superior Density

- Industry leading density

- Industry's smallest footprint
  - Reduce floor space requirements
  - Reduce tape handling
  - 10 LTO or 9 TS1150 tape TeraPacks

- TeraPack design allows TSeries libraries to use a fraction of the floor space required by the competition

Simplified Management

BlueScale Interface for all administration

- Status

- Configuration

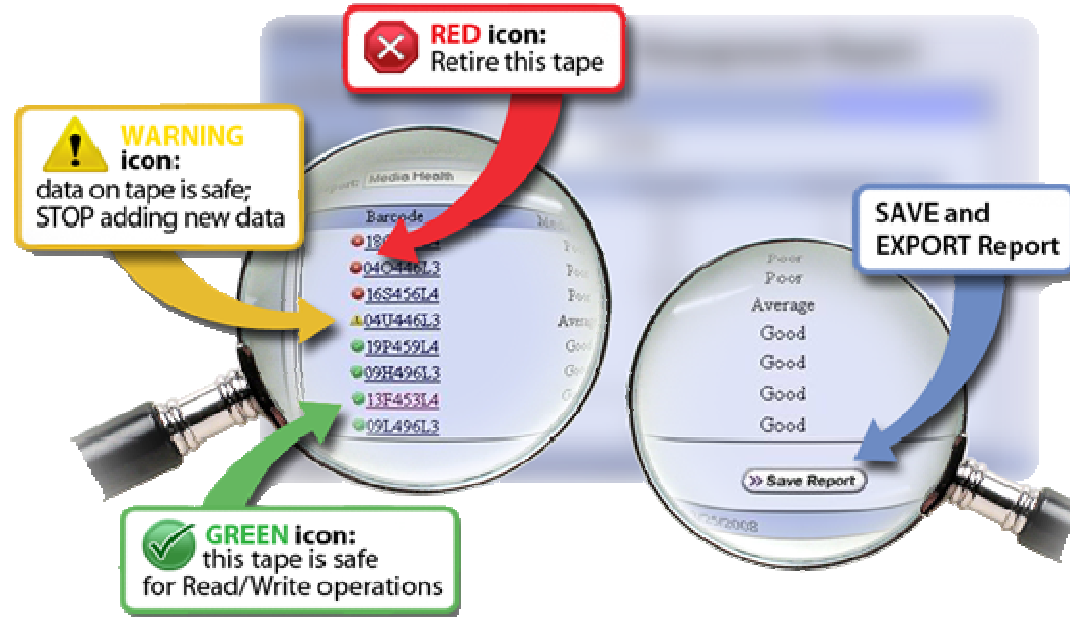- Monitoring

- Tuning

- Security

- Diagnostic

- Updates
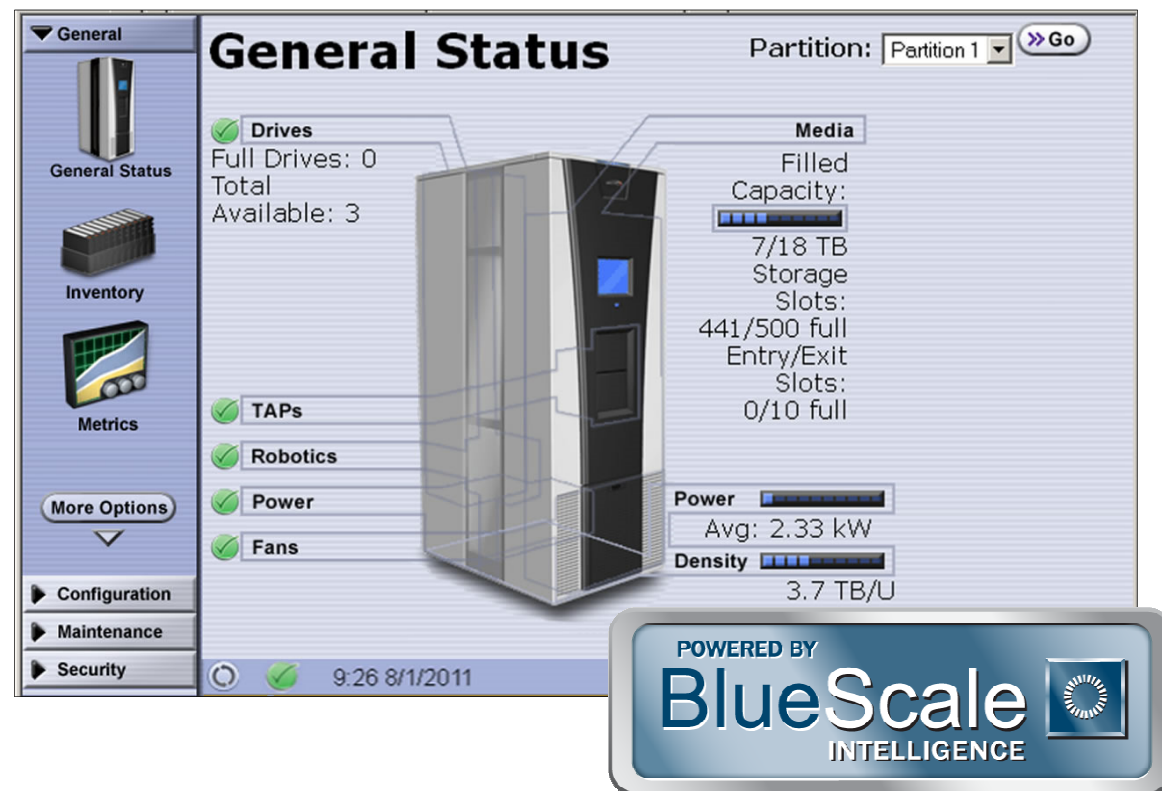
Intuitive, user friendly GUI for front panel and remote management

Proactive Media Health Reporting
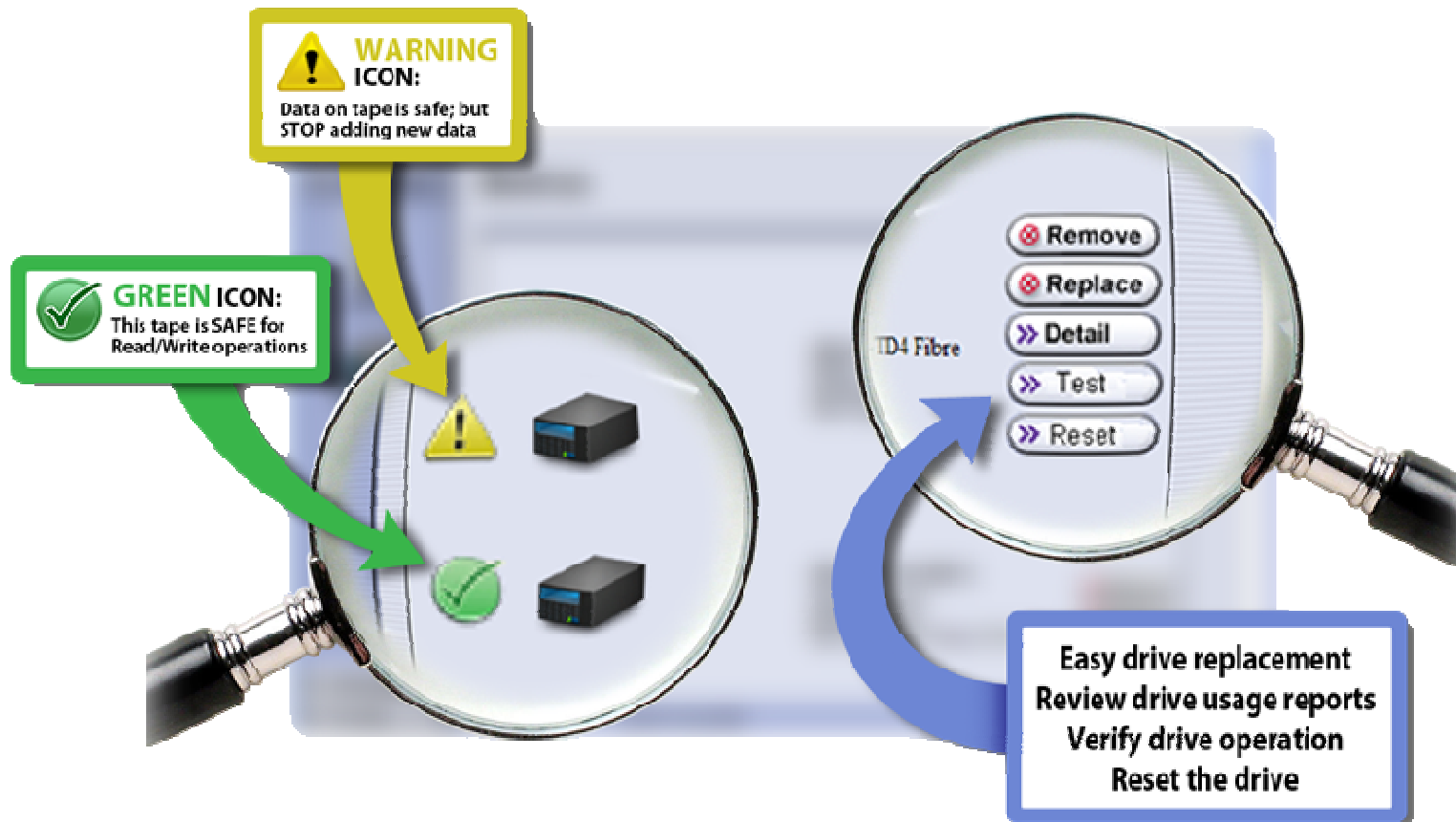
Media Lifecycle Management

- Over 40 data points tracked

- Advanced analytics determine health score

- Simple color coded reporting

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Proactive Drive Health Reporting

Drive Lifecycle Management

- Identify drive issues before they become problems

WARNING ICON:
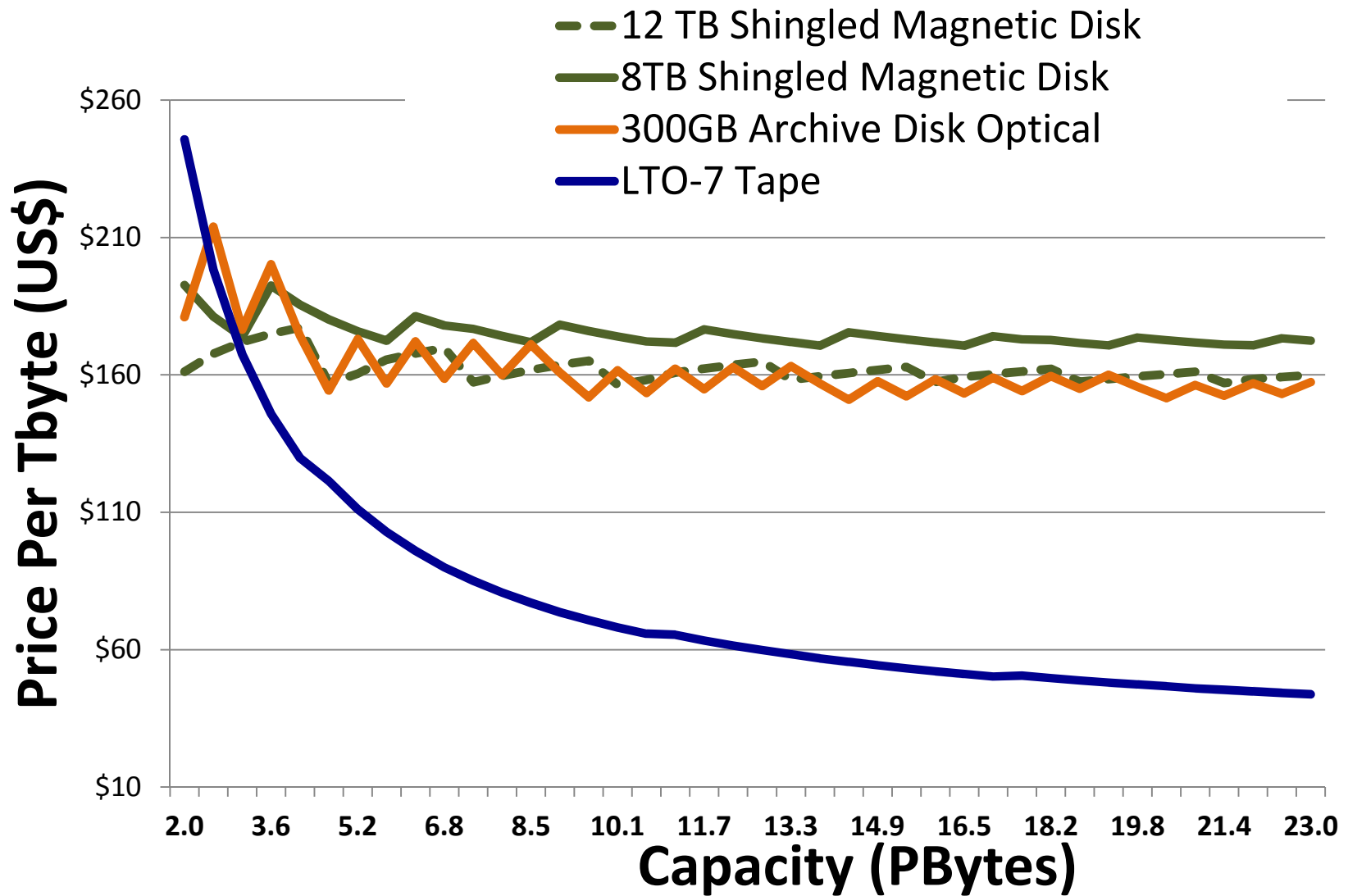Data on tape is safe; but STOP adding new data

GREEN ICON:
This tape is SAFE for Read/Write operations

TD4 Fibre

- Remove
- Replace
- Detail
- Test
- Reset

Easy drive replacement
Review drive usage reports
Verify drive operation
Reset the drive

Cost Projections and Other Products

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2017 Robotic Tape/Optical & Disk @List Price

Legend:
- 12 TB Shingled Magnetic Disk
- 8TB Shingled Magnetic Disk
- 300GB Archive Disk Optical
- LTO-7 Tape

Y-axis: Price Per Tbyte (US$)
X-axis: Capacity (PBytes)

Black Pearl and Spectra S3

S3/Object + Tape/Sequential Media Support + Removable Media Support w/ LTFS = Deep Simple Storage Service
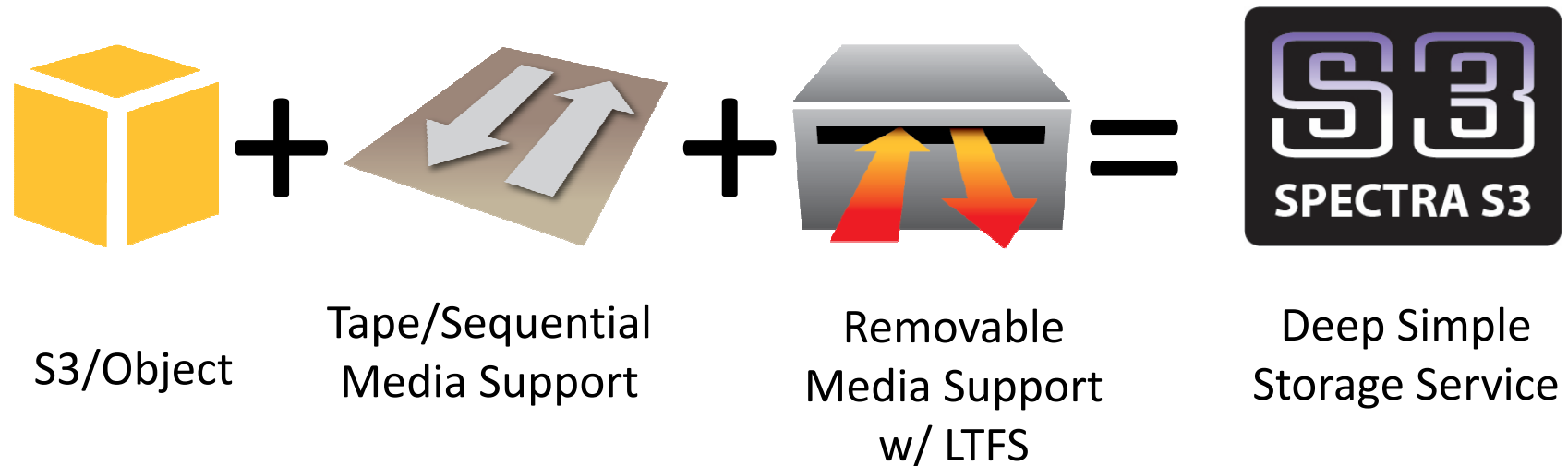
Start with Object, S3 and Rest

Use Archive media as the target

Spectra S3 facilitates an Object based Archive

Buying BlackPearl Storage Platform

- 4U head with BlackPearl SW
    - Includes the SAS Cache + SSD DB

ArcticBlue nodes:

Each Band

- 192 TB RAW – 24 Drives
    - Each band comes with one global spare
    - Three parity drives (20+3) with automatic intelligent rebuilds
    - Or 20+3+1

Minimum Configuration is two Bands

- Then Expand ArcticBlue One Band at a time

Full ArcticBlue node - 96 drives

- Each ArcticBlue node:

    Read/Write – 775 (W)

    Idle – **140 (Watts)** with Drive Lifecycle Management

- Full Rack at 6.1PB - System Power Savings up to 80%

Thank you

- Questions