Smashing Bits: Comparing Data Compression Techniques in Storage

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AHA Introduction

- **Moscow, ID**

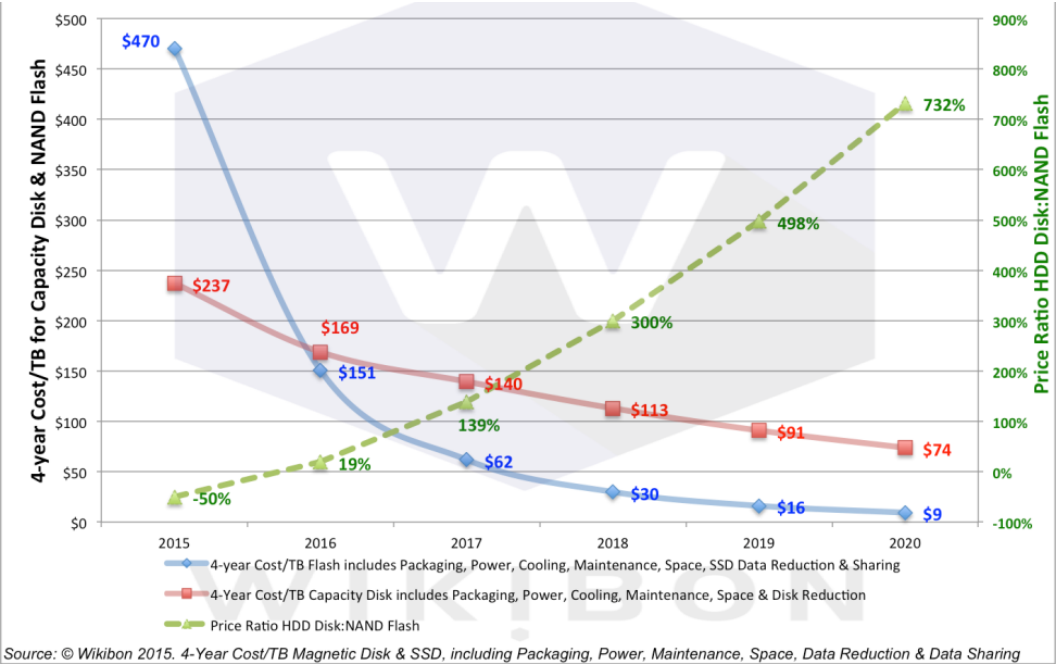
- **Relevant History**
  - 1988 NASA Startup
  - 2006 First GZIP Compression IC
  - 2014 80Gbps PCIe GZIP Accelerator
    - Fastest GZIP Accelerator

- **Coding Technology Experts**
  - Error Correction
  - Data Compression
  - Encryption

Are you prepared for the future?

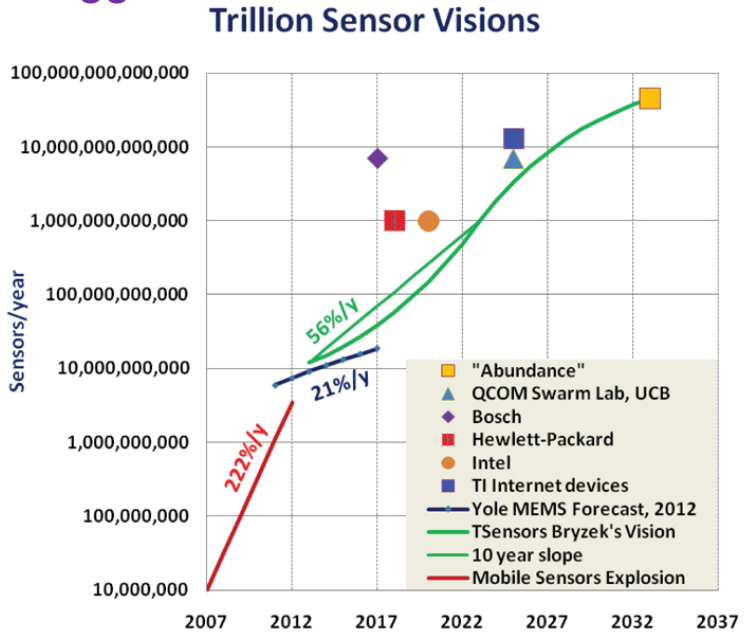
advanced hardware accelerators

- **Flash is the Future**
  - Lower Cost, High Performance

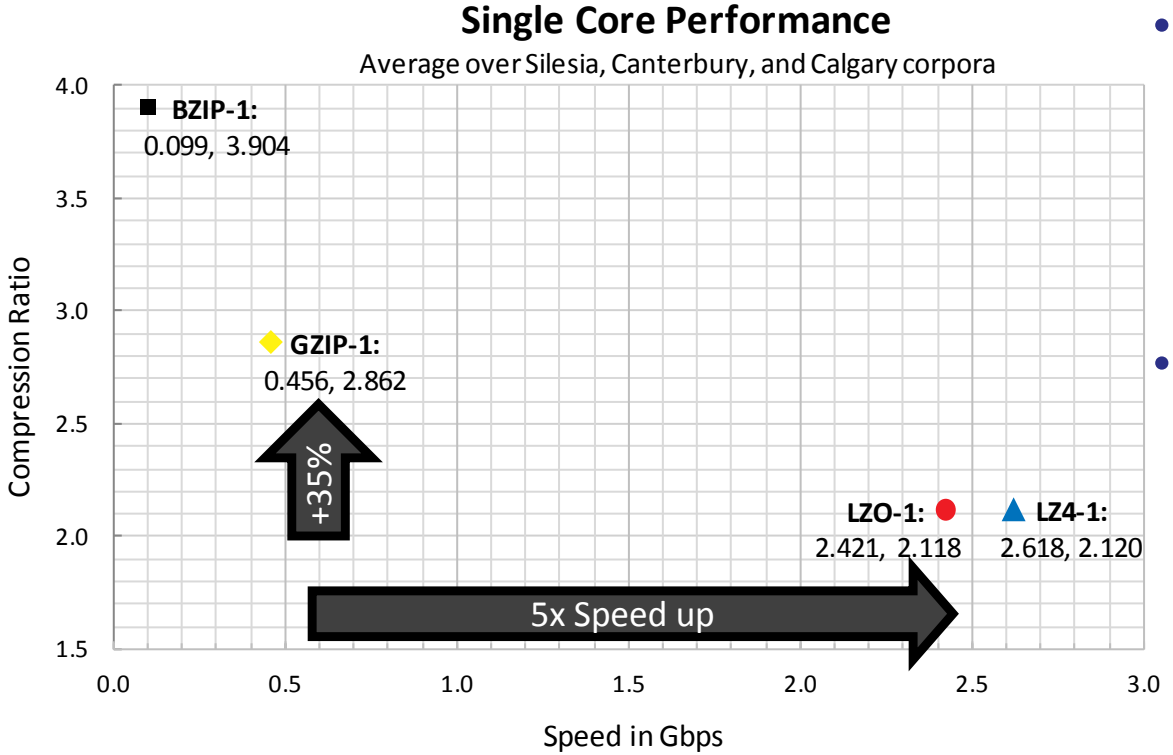


Source: © Wikibon 2015. 4-Year Cost/TB Magnetic Disk & SSD, including Packaging, Power, Maintenance, Space, Data Reduction & Data Sharing

- **Biggest Data: Industrial IoT**
  - $225 billion by 2020
  - Biggest of all Data



Data Compression Challenge



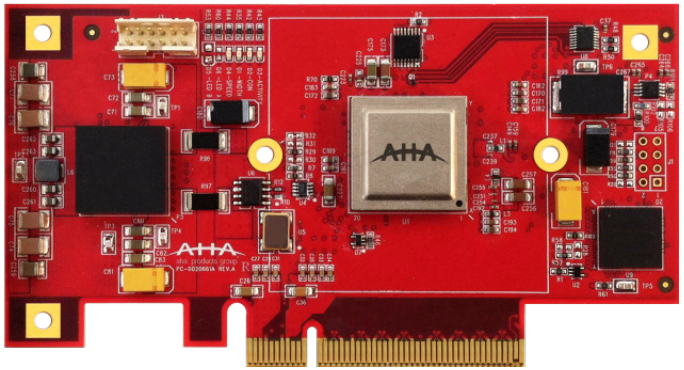
- **Top Speed w/ LZ4 & 20 cores**
  - 20 Cores X 2.618 Gpbs = 52.4 Gbps

100% of server processing data compression

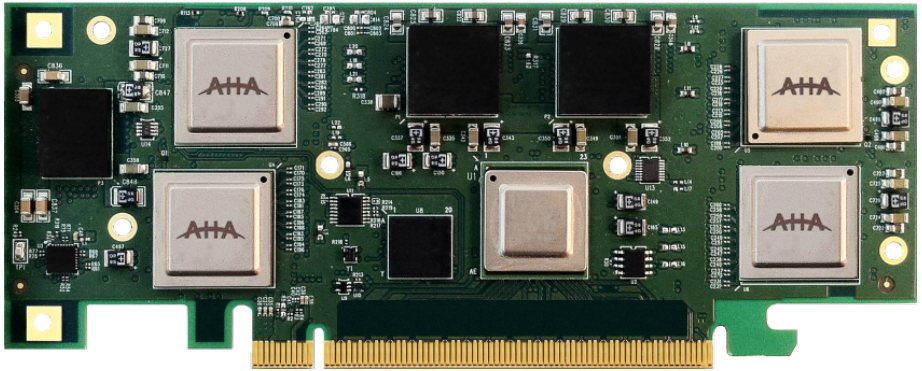
- **Options**
  - Customer buys more servers
  - High performance, lower cost?

AHA37X Family

- **Interface**
  - PCIe interface
- **Algorithms**
  - GZIP/ZLIB
- **Board by Compression Speed**
  - AHA371 – 10 Gbps
  - AHA372 – 20 Gbps
  - **AHA374 – 40 Gbps**
  - AHA378 – 80 Gbps



AHA371, AHA372



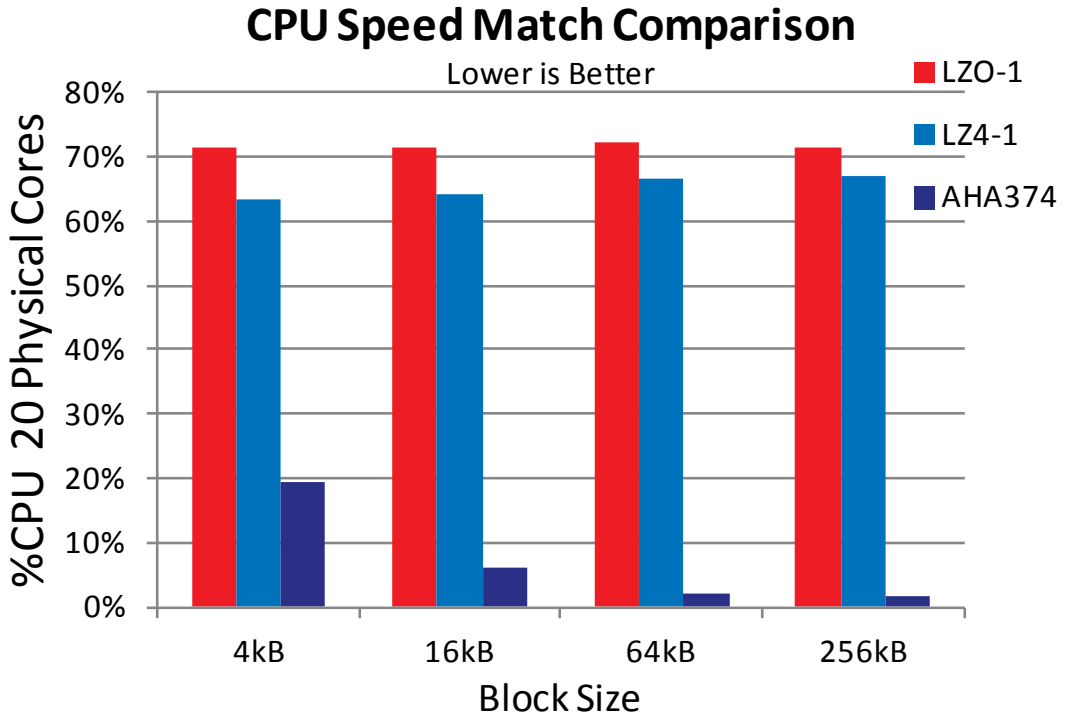
AHA374, AHA378

Experiments Summary

- **Compression Techniques Examined**
  - LZO, LZ4, AHA374, GZIP-1
- **Compared 40Gbps/8GBps Speed Match**
  - CPU Utilization
  - Power Consumption
  - Compression Ratio
- **Block Sizes**
  - 4kB, 16kB, 64kB, 256kB
- **Hardware**
  - Server: HP Proliant DL380 Gen8
  - CPU: E5-2660v2 @ 2.20GHz
    - Dual 10 Core

Reduced CPU Utilization

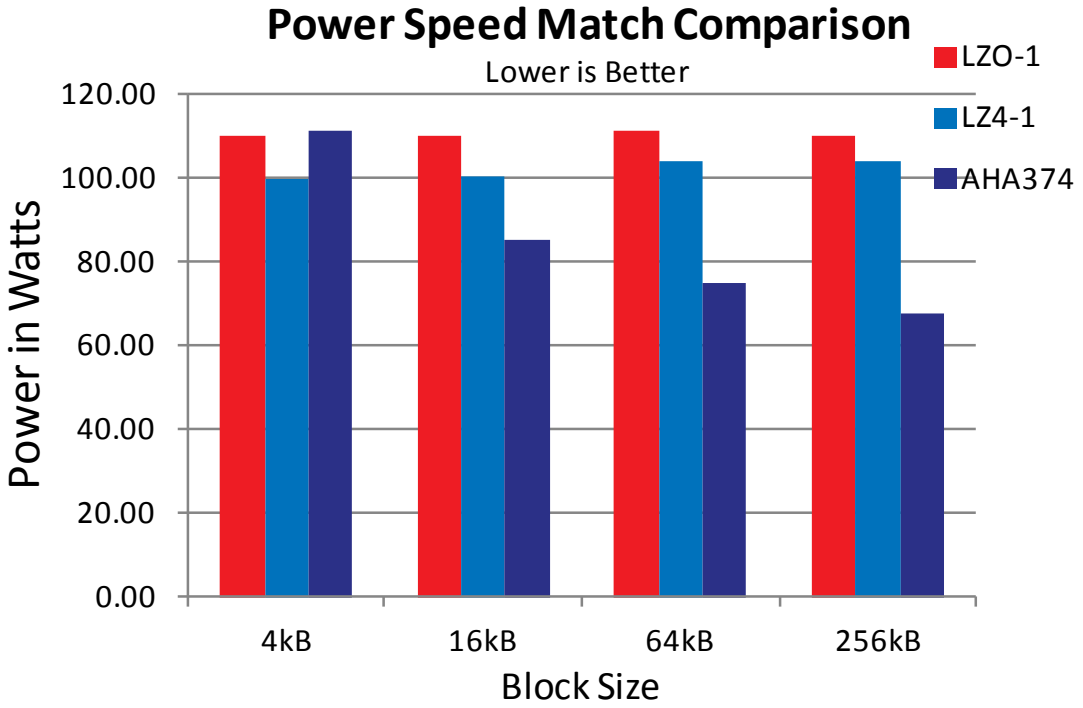
- **40 Gbps (8GBps) Speed Match**
  - Normalized for Comparison
- **%Utilization of 20 Cores**
  - 40% = 8 cores
  - 50% = 10 cores
  - 70% = 14 cores
- **GZIP/BZIP CPU Not Shown**
  - GZIP 410% - 309%
  - BZIP 4247% - 2098%



AHA 374 offloads CPU resources

Lower Average Power

- **40 Gbps (8GBps) Speed Match**
  - Normalized for Comparison
- **Power Calculations**
  - Subtracted Idle Power
- **LZO/LZ4 Power**
  - Modeled from experiments
- **AHA374 Power**
  - Direct Measured



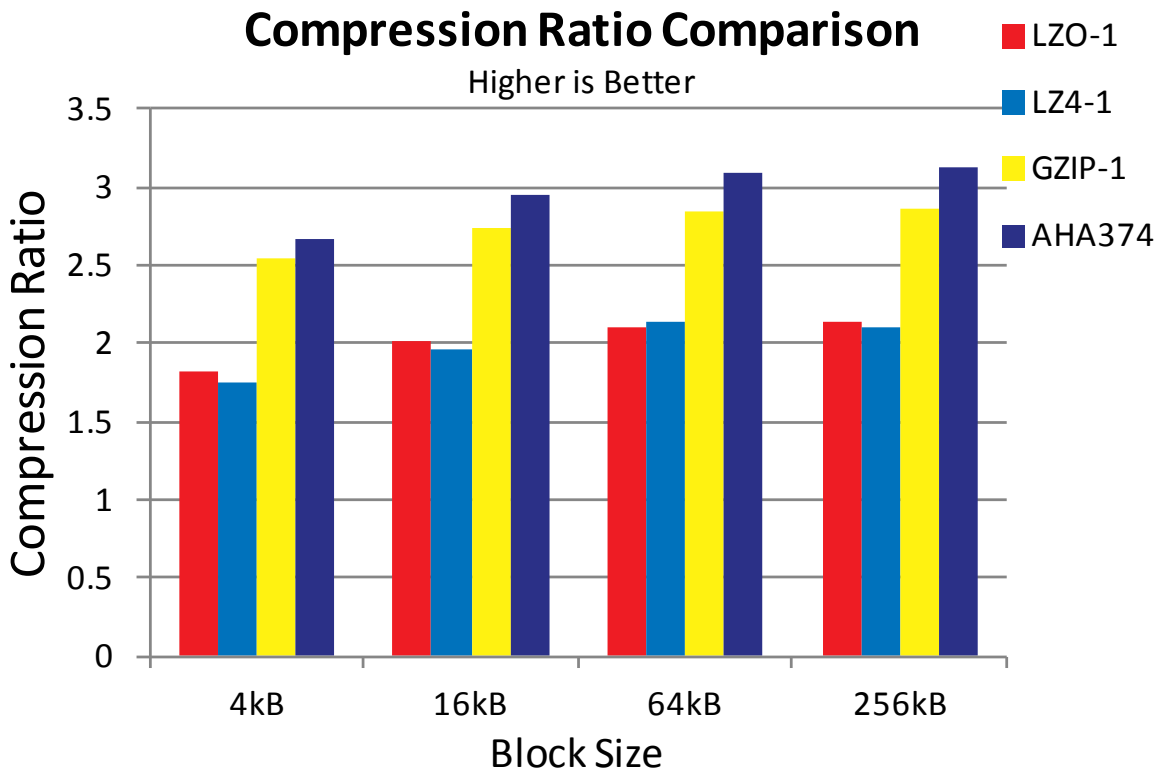
At >4kB blocks AHA374 uses less power

Summary

- **Industrial IoT**
  - Biggest Ephemeral Data
  - High Data Rates
- **AHA374 GZIP Accelerator**
  - High Compression Speed
  - Frees CPU Resources
  - Increases Capacity and Cycle Life

Increased Capacity

- **Average over Corpora**
  - Silesia, Canterbury, Calgary
- **4kB BZIP 2.68:1**
  - AHA374 2.66, 99% of BZIP
- **AHA374~GZIP-5**
  - GZIP-1 lowest GZIP CR
- **Longer Cycle Life**
  - Higher Compression Ratio



AHA374 provides almost 50% more capacity than LZ4/LZO

Contact Information

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