Visions for Ethernet Connected Drives

Chris DePuy,
Vice President, Dell'Oro Group
chris@delloro.com

March 25, 2015

SNIA™
Ethernet Storage Forum

Webcast Presenters

David Fair, SNIA –ESF Chair – Intel

Vice President, Dell'Oro Group

Vice President, Storage Systems Research

SNIA Legal Notice

SNIA Ethernet Storage Forum

- The material contained in this tutorial is copyrighted by the SNIA unless otherwise noted.
- Member companies and individual members may use this material in presentations and literature under the following conditions:
  - Any slide or slides used must be reproduced in their entirety without modification
  - The SNIA must be acknowledged as the source of any material used in the body of any document containing material from these presentations.
- This presentation is a project of the SNIA Education Committee.
- Neither the author nor the presenter is an attorney and nothing in this presentation is intended to be, or should be construed as legal advice or an opinion of counsel. If you need legal advice or a legal opinion please contact your attorney.
- The information presented herein represents the author's personal opinion and current understanding of the relevant issues involved. The author, the presenter, and the SNIA do not assume any responsibility or liability for damages arising out of any reliance on or use of this information.

  NO WARRANTIES, EXPRESS OR IMPLIED. USE AT YOUR OWN RISK.

Visions for Ethernet Connected Drives Today's Agenda

SNIA Ethernet Storage Forum

- Introductions
- Market Statistics
- Viewpoints—Audiences Interviewed
- Status of Ethernet Connected Drive Trend
- Potential Benefits/Use Cases and Challenges of Ethernet Drives
- System-level Architectural Changes to Support Ethernet Drives
- Open Discussion and Q&A

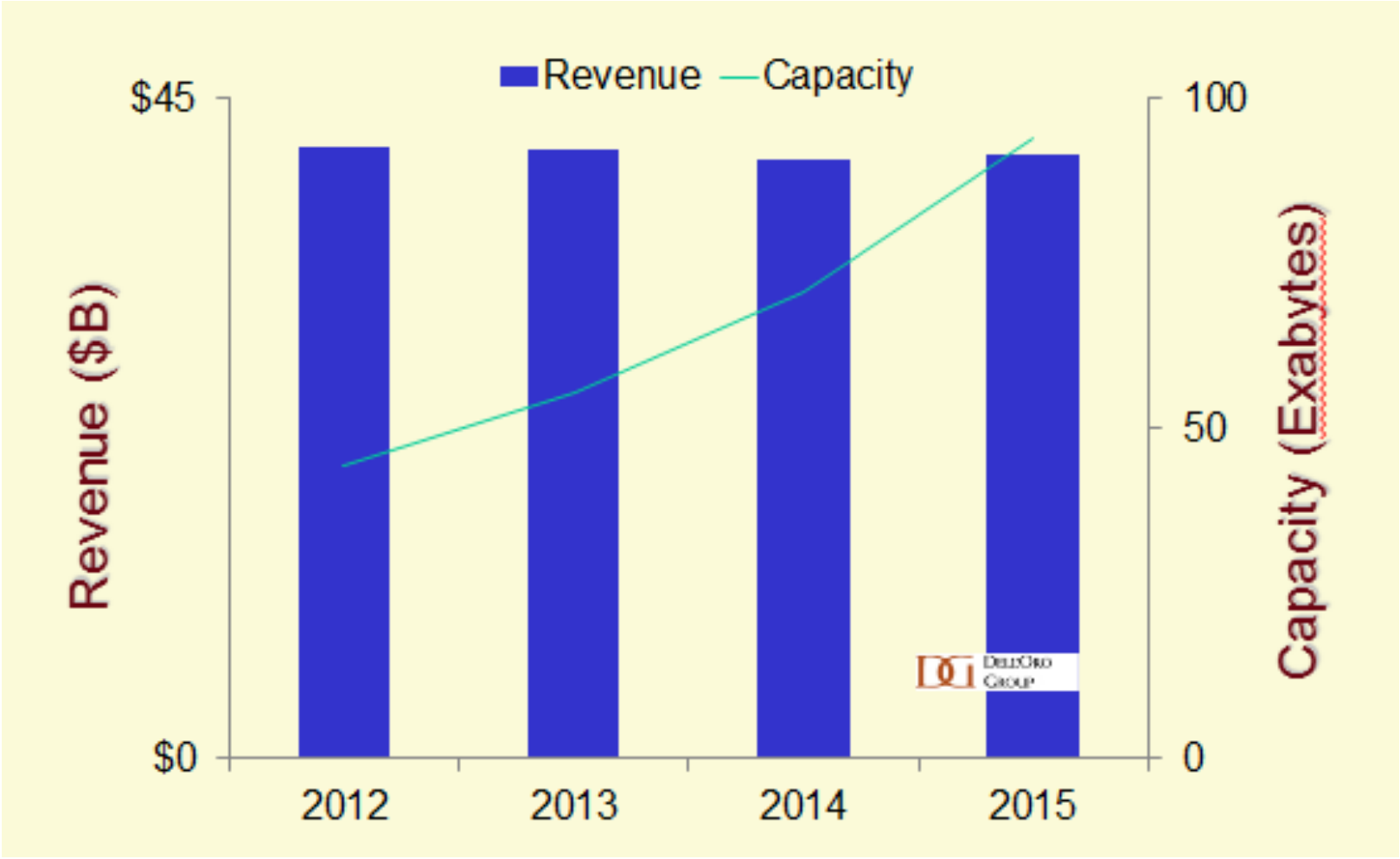
Visions for Ethernet Connected Drives Market Statistics – For Overall Market

SNIA Ethernet Storage Forum

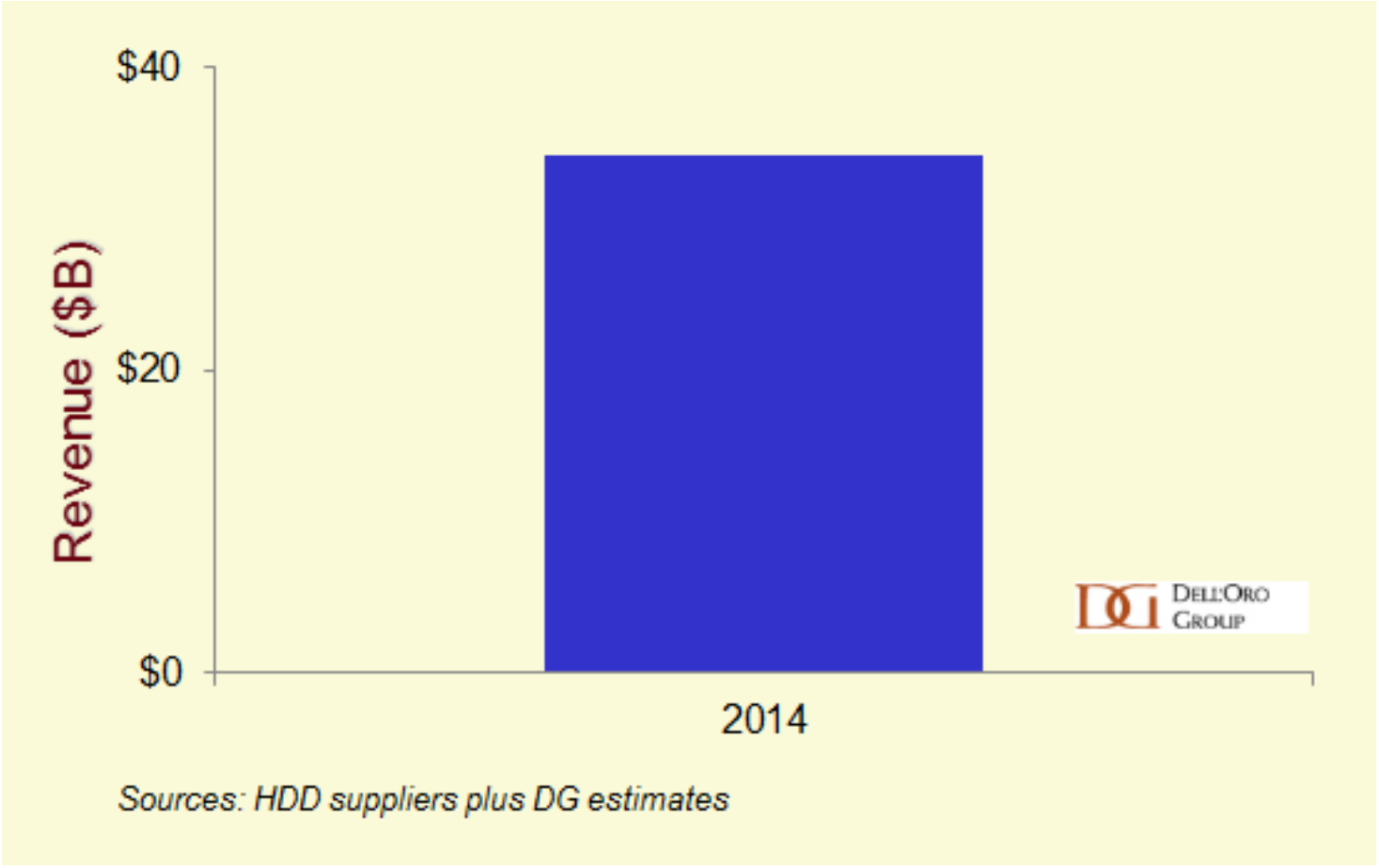
- Storage Systems
  - all HDD and SSD's included
- HDD
  - all drives
  - enterprise drives
- Cloud Computing
  - servers in cloud versus enterprise
- White Box Storage
  - total storage market

Visions for Ethernet Connected Drives Storage Systems Revenues & Capacity

SNIA Ethernet Storage Forum

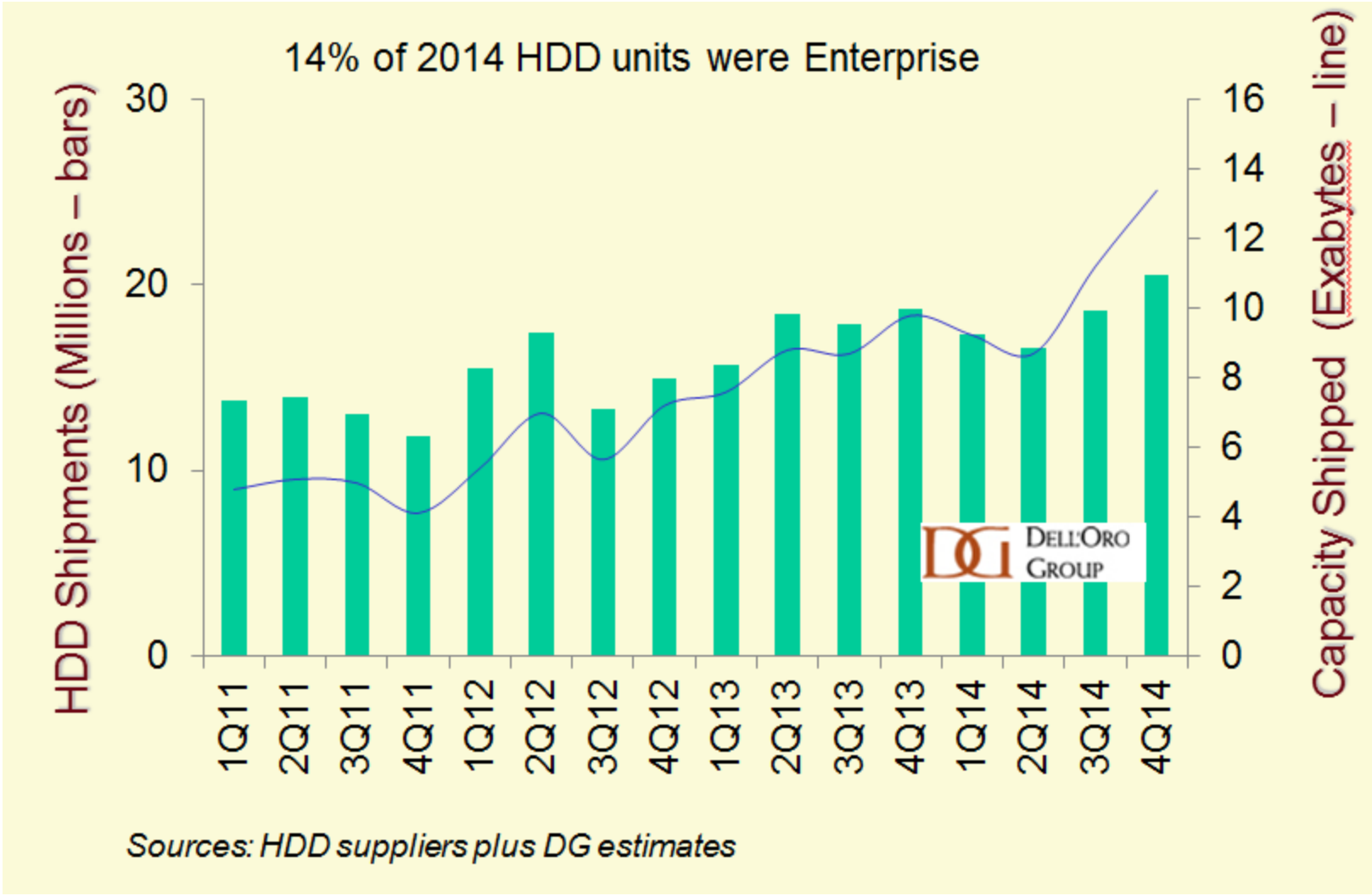


Visions for Ethernet Connected Drives
Worldwide HDD Revenues



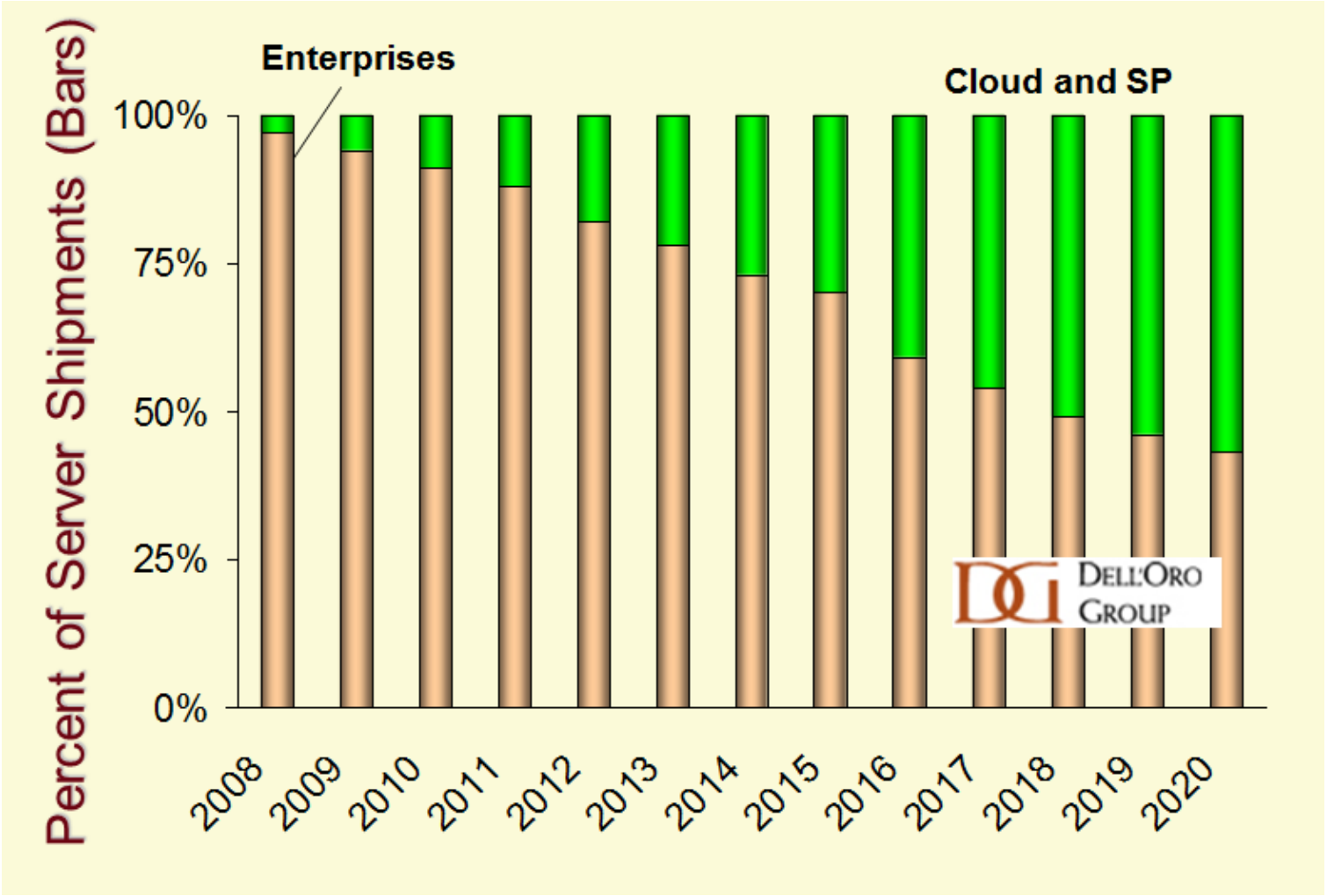
Visions for Ethernet Connected Drives Enterprise HDD Shipments and Capacity

SNIA Ethernet Storage Forum



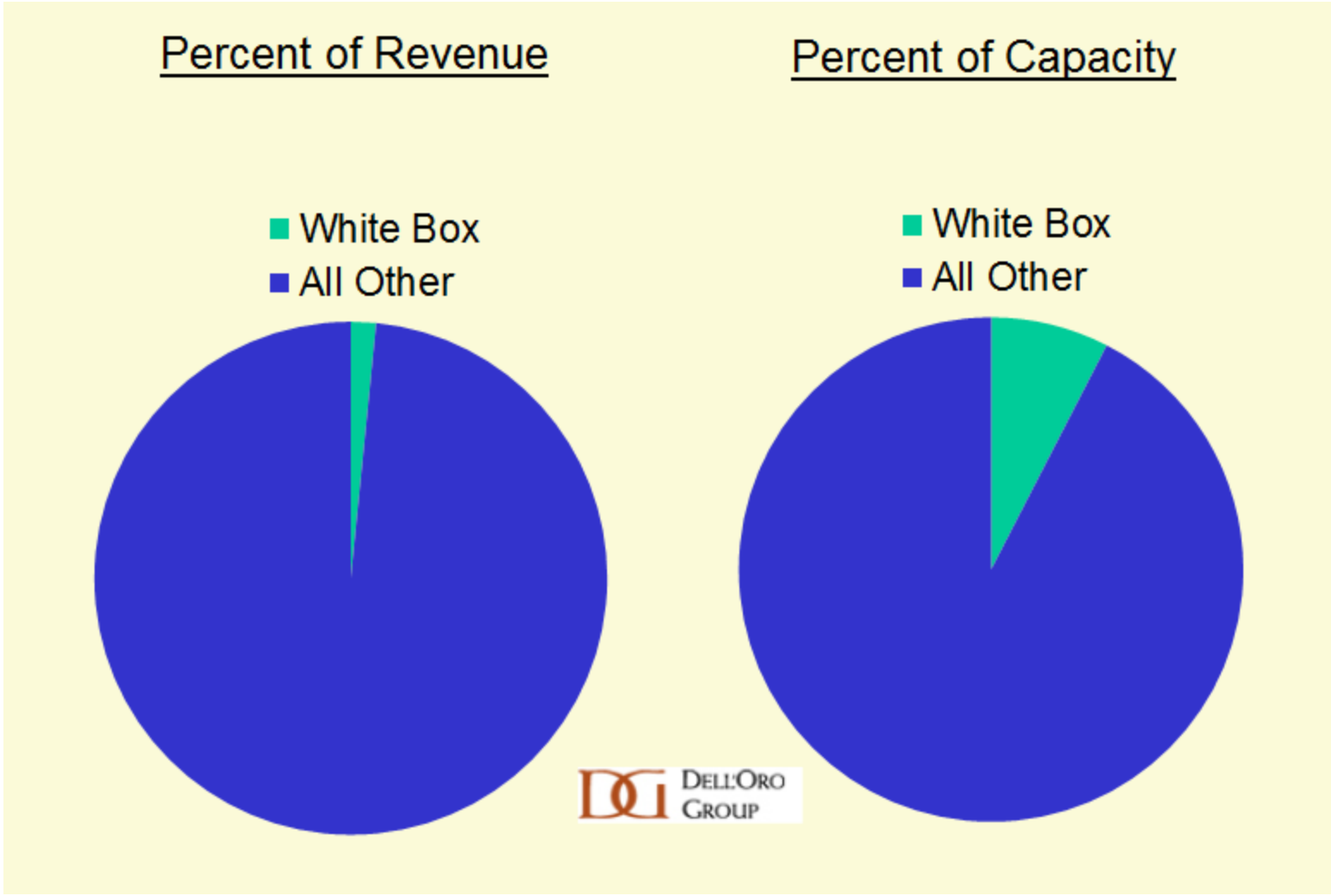
Visions for Ethernet Connected Drives Server Market Adoption

SNIA
Ethernet Storage Forum



Visions for Ethernet Connected Drives Systems Level White Box Effect – 3Q14

SNIA Ethernet Storage Forum



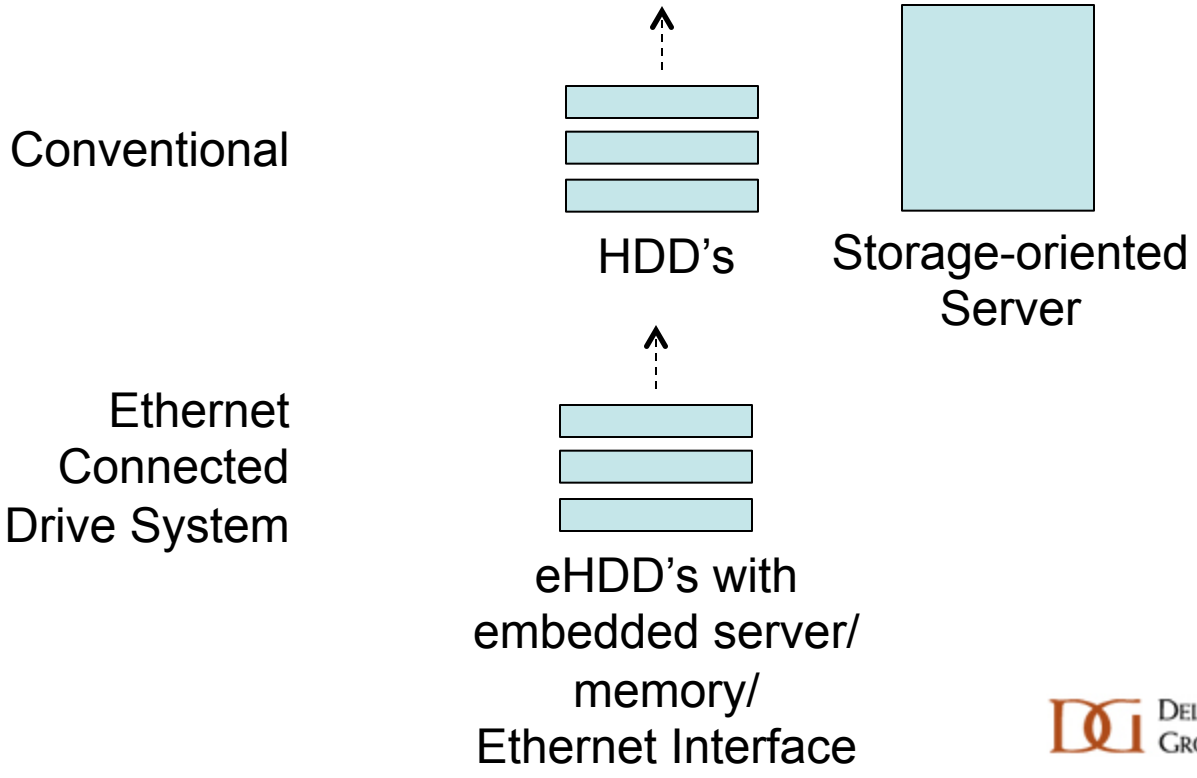
Visions for Ethernet Connected Drives Unstructured Data Growing Fast

SNIA
Ethernet Storage Forum

Market Status:

- Data explosion – store everything, unstructured, growing very fast
- IT budgets flat
- Server pricing stable
- HDD price erosion stabilizing
- HDD density improving, but not like in prior years

Visions for Ethernet Connected Drives
What is This Type of Drive?



The economic argument:

$$n_{eHDD} * eHDD_{px} < n_{HDD} * HDD_{px} + n_{server} * Server_{px}$$

Visions for Ethernet Connected Drives Viewpoints

SNIA
Ethernet Storage Forum

- We surveyed suppliers in the following industries:
- HDD
- SSD
- Hardware/Server System
- Semiconductor
- Software

…As well as some enterprises

Visions for Ethernet Connected Drives Where Are We Today?

SNIA
Ethernet Storage Forum

- Ethernet Connected Drives trend is in its infancy – very early to make predictions
- One HDD vendor began early shipments
- Handfuls of customers are trialing the technology
- Cost models have been estimated by various players
- Abundance of start-ups (not all related to this trend, but lots of new ideas)
- Killer applications still being considered

…But, it looks exciting and the served market is huge…

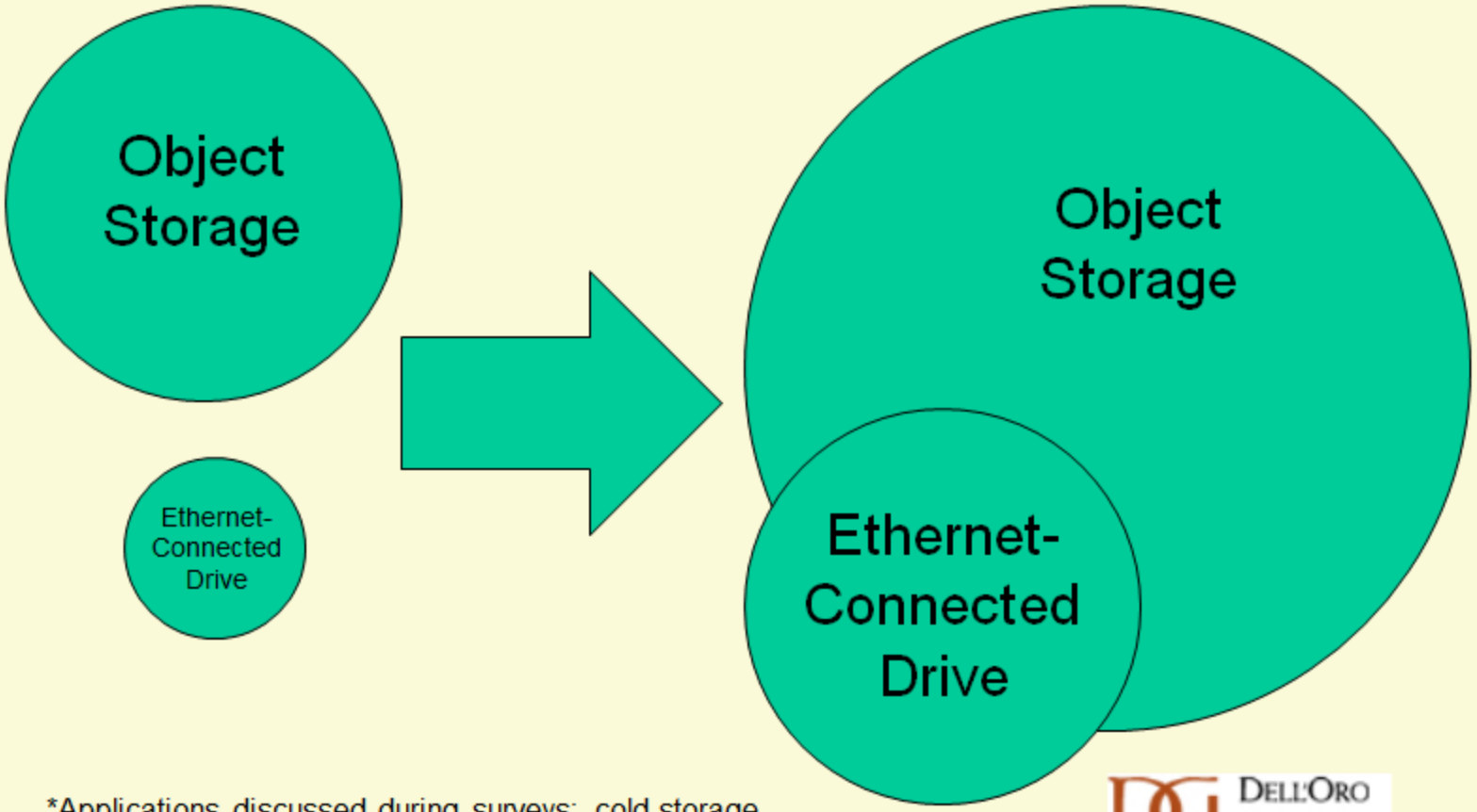
Visions for Ethernet Connected Drives
Object Storage and Ethernet Drives

SNIA
Ethernet Storage Forum

- Two trends potentially coming together…
- HDD prices, IT spending trends, cloud computing phenomenon converging
- Potential benefits of adopting Ethernet Connected Drives

Visions for Ethernet Connected Drives
Object Storage & Ethernet Connected Drives

SNIA Ethernet Storage Forum



*Applications discussed during surveys: cold storage, archival, near-line/mid-range

DELL'ORO GROUP

Visions for Ethernet Connected Drives Potential Benefits

SNIA Ethernet Storage Forum

Ethernet Connected Drives is an innovation that may reduce capital and operating costs by:

- Reducing software stack (File System, Volume Manager, RAID system) and corresponding server infrastructure
- Reducing connectivity costs and complexity

Costs vary by:

- Application (e.g. cold storage, archiving, etc.)
- Cost of additional components on each HDD (CPU, memory, interface)

Visions for Ethernet Connected Drives Use Case #1 – Object-Based Cluster

SNIA Ethernet Storage Forum

Use Case #1 – Object-Based Cluster:

- Vendor-supplied TCO Cost/Tb shows nearly 40% TCO savings for a 500 PB deployment
- We reviewed the material and understand that the main difference between conventional and Ethernet Connected Drive-based system is that Object Servers are eliminated
- The estimated capex saving is 26% and estimated annual power expense saving is 61%

Visions for Ethernet Connected Drives
Use Case #2 – Archiving

SNIA
Ethernet Storage Forum

Use Case #2 – Archiving:

- 1 PB economy file storage (large file archiving)
- Comparing Ethernet Connected Drive architecture to conventional architecture
  - Ratio of server node CPU / drive is higher
  - Drive density in chassis is higher
- TCO saving is 36%, due to lower hardware and power/ cooling savings

Visions for Ethernet Connected Drives Use Case #3 – Online Backup Service

SNIA Ethernet Storage Forum

Use Case #3 – Online Backup Service:

- Well-known cloud-based backup service company for SMB & enterprise customers claims
  - Is testing Ethernet Connected Drives in an object storage environment using SWIFT interface, working to prove that it can scale to 1 PB using only two proxy servers
  - The company estimates the two proxy servers would manage several racks of drives with need for traditional storage servers and direct attached drives
  - Estimated TCO savings 33.5%

Visions for Ethernet Connected Drives
Use Case #4 – Analytics

SNIA
Ethernet Storage Forum

Use Case #4 – Analytics:

- With processor/memory on each HDD, as data is stored, it can be pre-processed, leaving metadata that can be easily searched
- Applications can leverage this metadata to provide very rapid query responses when compared to centrally processed responses
- Each HDD CPU/Memory system can search contents quicker, and parallel-computing oriented applications can leverage this as a benefit

Visions for Ethernet Connected Drives
Use Case #5 – Nearline Storage

SNIA
Ethernet Storage Forum

Use Case #5 – Nearline Storage:

- While this viewpoint is in the minority, we understand that some suppliers expect Ethernet Connected Drives may compete in environments such as nearline storage, which could be interpreted as moving to higher-performance implementations. No cost justifications were provided, but we chose to share the viewpoint because it is interesting!

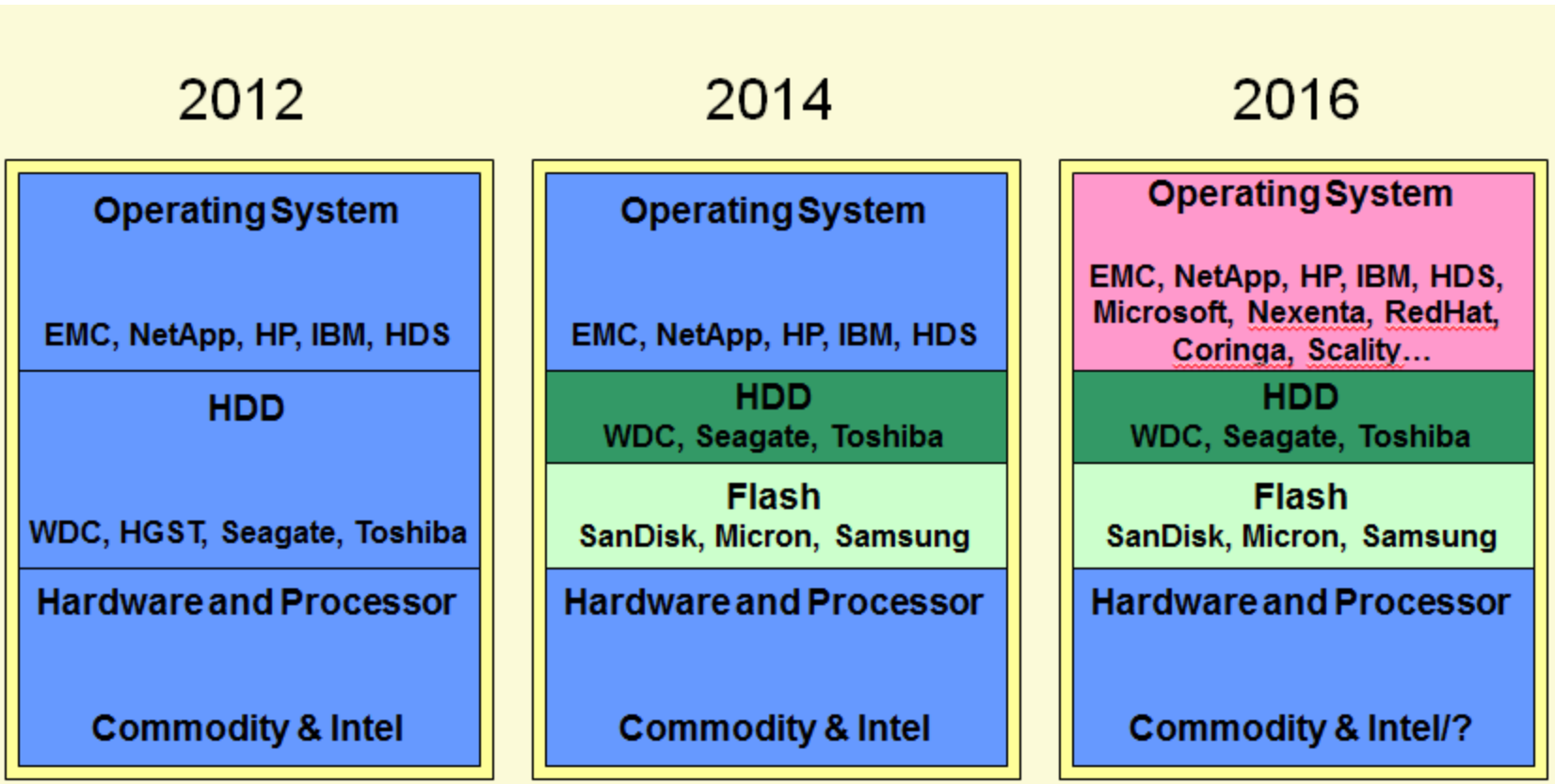
Visions for Ethernet Connected Drives Challenges

SNIA Ethernet Storage Forum

- Dissenting views point out the following:
  - Ethernet drives concept around for past 15 years
  - No single technical approach in the market – some offer “Key Value” approach, others allow an O/S to be installed on the drive
  - Many use cases presented are cost-sensitive, and dissenting views say OEMs and SPs won’t pay a premium for HDDs
  - Ethernet drive means hundreds of CPUs to manage
  - Each drive would be unaware of contents of other drives
- Flash not currently part of this Ethernet Connected Drive vision. External flash capacity growing 100% Y/Y
- New use cases / applications likely to drive this trend – is it Object Storage?

Visions for Ethernet Connected Drives Storage Value Chain Evolution

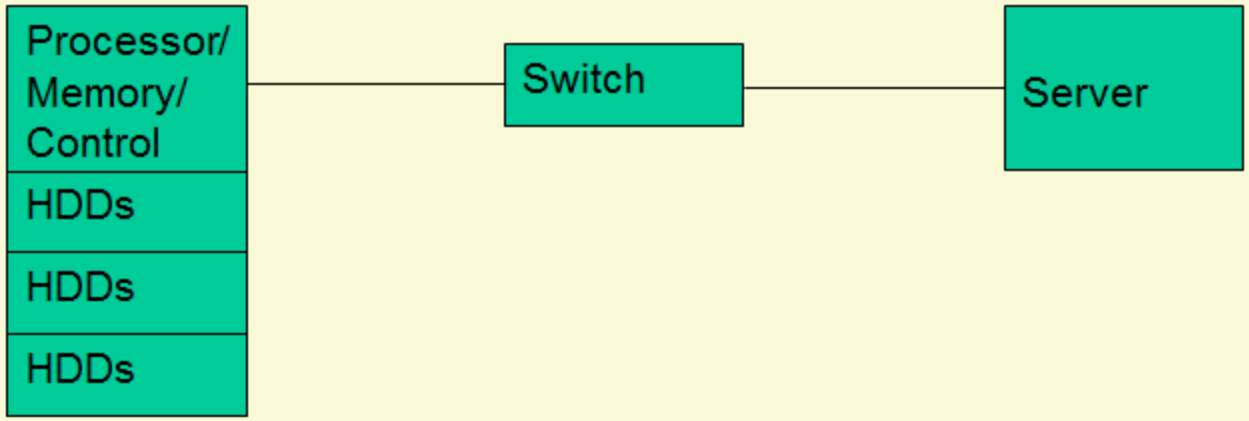
SNIA Ethernet Storage Forum



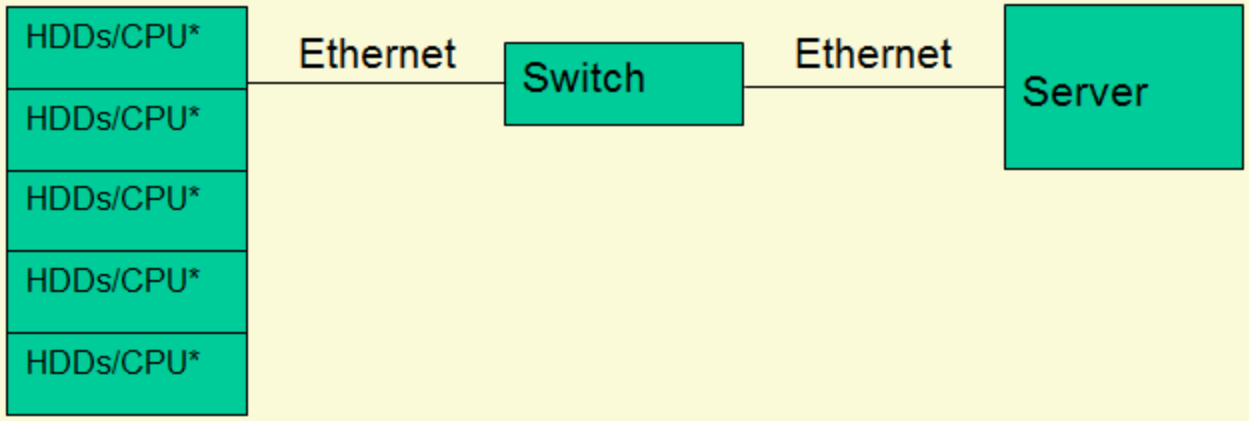
Visions for Ethernet Connected Drives Architectural Discussion

- Software Defined Storage and White Box / Stripped Box impact
- Difference between traditional systems and potential Ethernet Connected Drive systems
- What about Flash and NVMe systems?
- Value chain discussion
- Discussion of cloud versus enterprise architecture evolution

Visions for Ethernet Connected Drives
Traditional Storage Architecture



Visions for Ethernet Connected Drives
Evolving Ethernet Drive-based Architecture

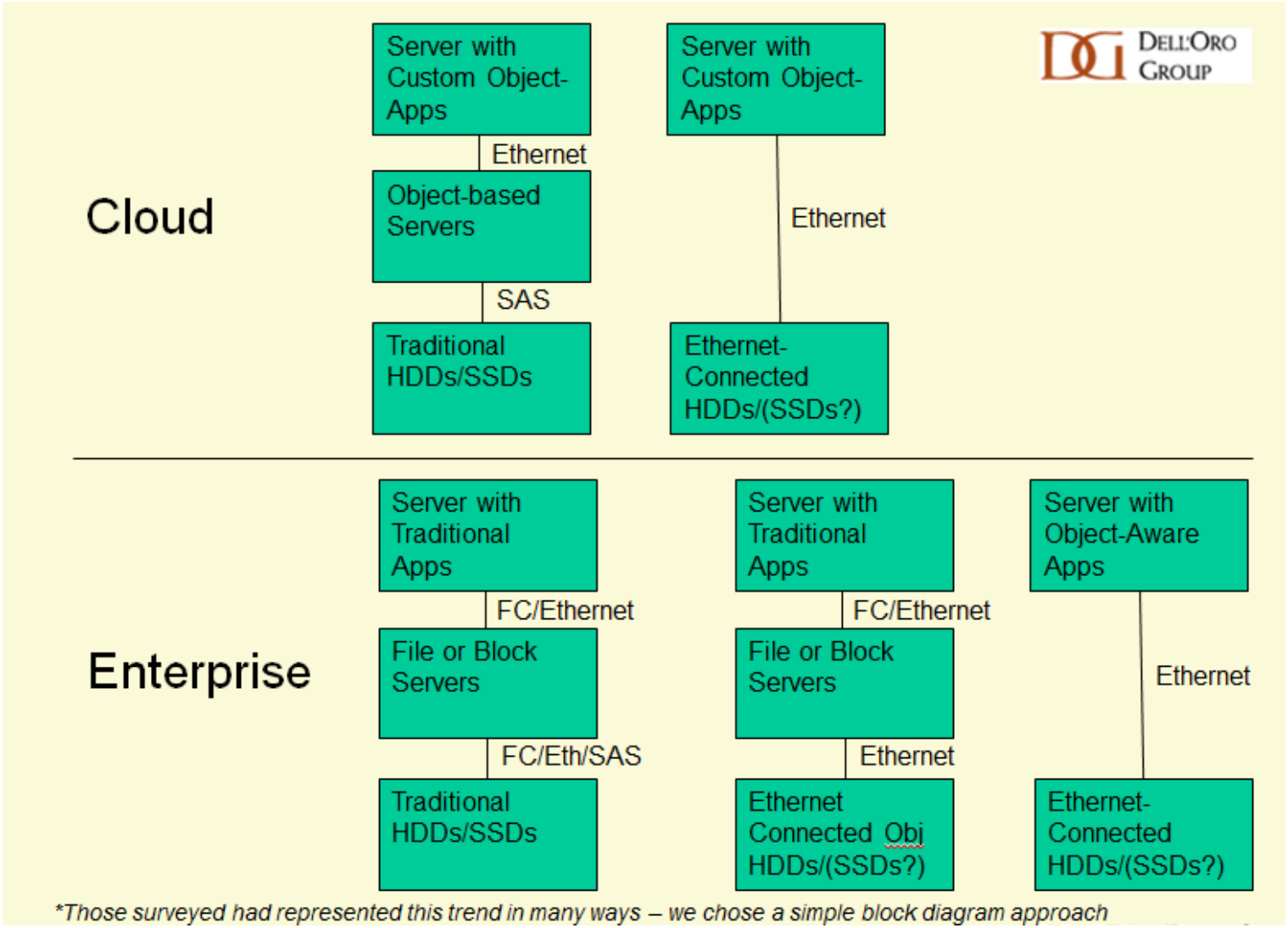


*Each HDD equipped with CPU, memory, Ethernet connection

*The ratio of HDD to Server varies for each application / use case

Visions for Ethernet Connected Drives Potential Evolution of Object Storage*

SNIA Ethernet Storage Forum



Visions for Ethernet Connected Drives Summary of Survey Findings

SNIA Ethernet Storage Forum

Based on our interviews:

- There is no consensus, but some common themes:
- Ethernet Connected Drives will likely cost more
- Parallel/local processing of data at each HDD is when benefits occur
- Apps likely need to be re-written – new apps being written for new use cases
- If Ethernet drives are used, number of storage-oriented servers could be reduced

After This Webcast

SNIA Ethernet Storage Forum

- This webcast and a PDF of the slides will be posted to the SNIA Ethernet Storage Forum (ESF) website and available on-demand
  - http://www.snia.org/forums/esf/knowledge/webcasts
- A full Q&A from this webcast, including answers to questions we couldn't get to today, will be posted to the SNIA-ESF blog
  - http://sniaesfblog.org/
- Follow us on Twitter @ SNIAESF

Visions of Ethernet Connected Drives Open Discussion

SNIA Ethernet Storage Forum

- We invite your questions…

Chris DePuy,
Vice President, Dell' Oro Group
chris@delloro.com

Thank You

SNIA™
Ethernet Storage Forum