Use Cases for iSCSI and FCoE: Where Each Makes Sense

Jeff Asher / NetApp

SNIA Legal Notice

- 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.

Abstract

- Use Cases for iSCSI and FCoE: Where Each Makes Sense
  - For many years, Fibre Channel was the protocol of choice for Storage Area Networks (SANs), but iSCSI and more recently Fibre Channel over Ethernet (FCoE) have challenged Fibre Channel's dominance. Datacenter Ethernet (DCE) is a series of enhancements to the common Ethernet implementation that allow the performance and resiliency required for storage networks. However, all of the improvements to Ethernet to allow FCoE to function provide those same benefits to iSCSI. Since, the hardware for DCE using FCoE and iSCSI is often identical, it comes down to a matter of choosing which protocol to run on the network. This tutorial will delve into these topics and help answer when each protocol may be appropriate to a particular set of requirements.

Market Perceptions

- FCoE = Enterprise Grade
- iSCSI = Non-critical apps
- No real evidence to suggest differences in reliability given identical hardware (discussed more later)

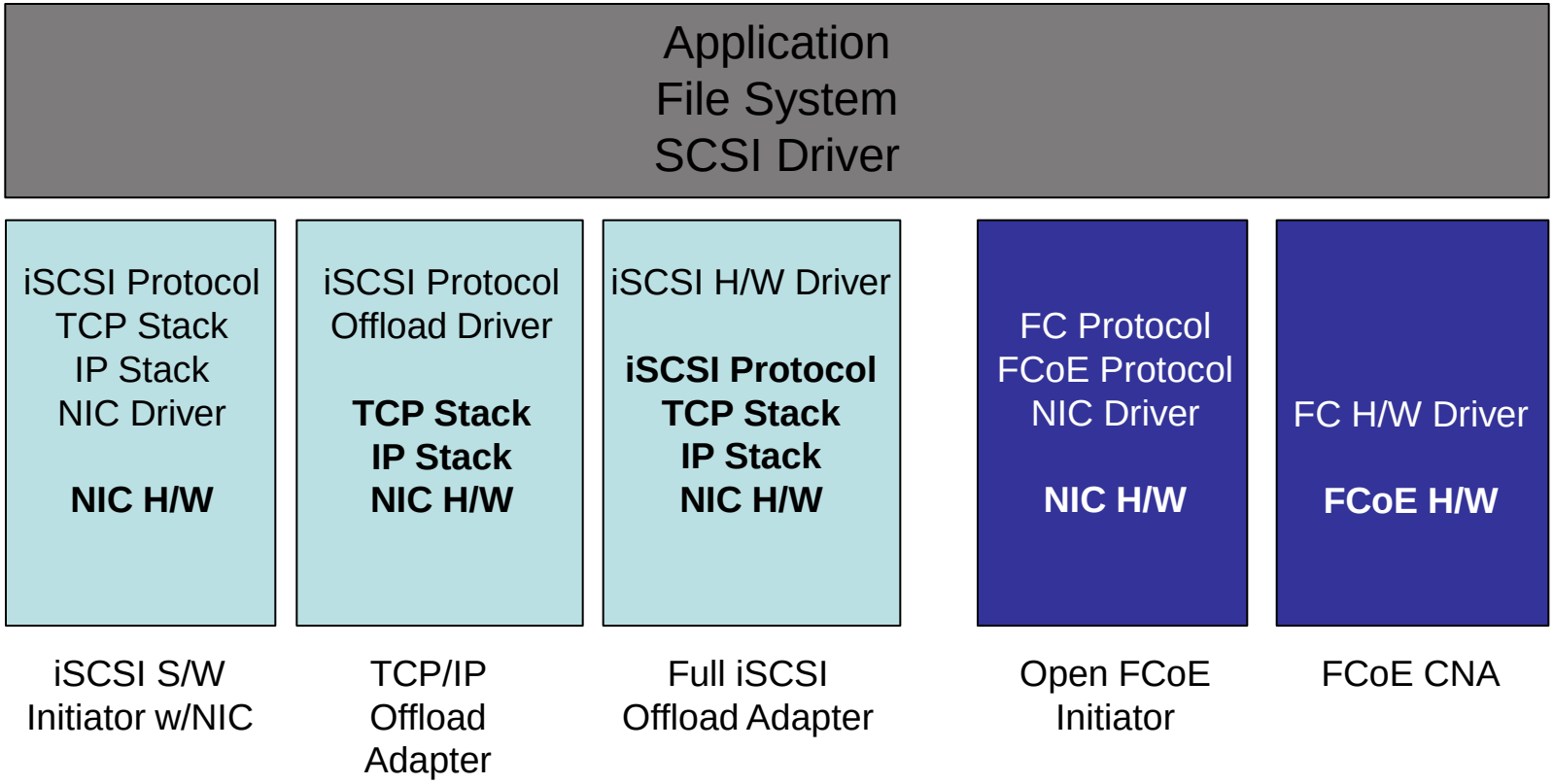
FCoE/iSCSI Hardware

- FCoE hardware all supports iSCSI
  - FCoE requires CNA
  - iSCSI runs on any NIC
- Easy to run both simultaneously on same links and ports
- DCB is required for FCoE but benefits iSCSI
  - 10GbE gives iSCSI same bandwidth as FCoE
  - Jumbo frames reduce overhead
  - Lossless ethernet
- Storage system support
  - iSCSI targets are much more common
  - Most FCoE target systems also support iSCSI

Technical Details

- Fibre Channel to FCoE
  - Ratified in 2009
  - Seamlessly integrates with traditional Fibre Channel
  - Encapsulates SCSI at OSI Data Link layer
  - Data Center Bridging Enhancements
  - Always implemented in hardware
- iSCSI
  - Ratified in 2003
  - 1GbE to 10GbE
  - Encapsulates SCSI in IP Packets
  - More layers of encapsulation increase latency
  - Implemented in either software or hardware

Protocol Stack Comparison



BOLD - Hardware

Decision Factors

- Topology Requirements
- Applications Requirements
- Performance Requirements
- Resource Utilization
- Skills and Support

Topology Requirements

- FCoE has more stringent topology requirements than iSCSI
  - DCB connectivity is required end-to-end
  - Initiator and target must be on same layer 2 segment
  - FCoE requires customer to pay more attention to interoperability
- Very few topology limitations for iSCSI
  - Initiator and target can be on different subnets
  - Non-DCB links in the path are supported
- An environment that takes advantage of iSCSI's topology flexibility may encounter reduced performance.
  - May not meet storage and application vendor best practices
  - Layer 3 hops increase latency

Application Requirements

- In practice, an application can't distinguish between iSCSI and FCoE
  - Ability to identify the difference if important to the customer
- Application vendor may specify protocol
  - Protocol restrictions more common in healthcare and financial application environments
  - Protocol choice driven by vendor qualifications

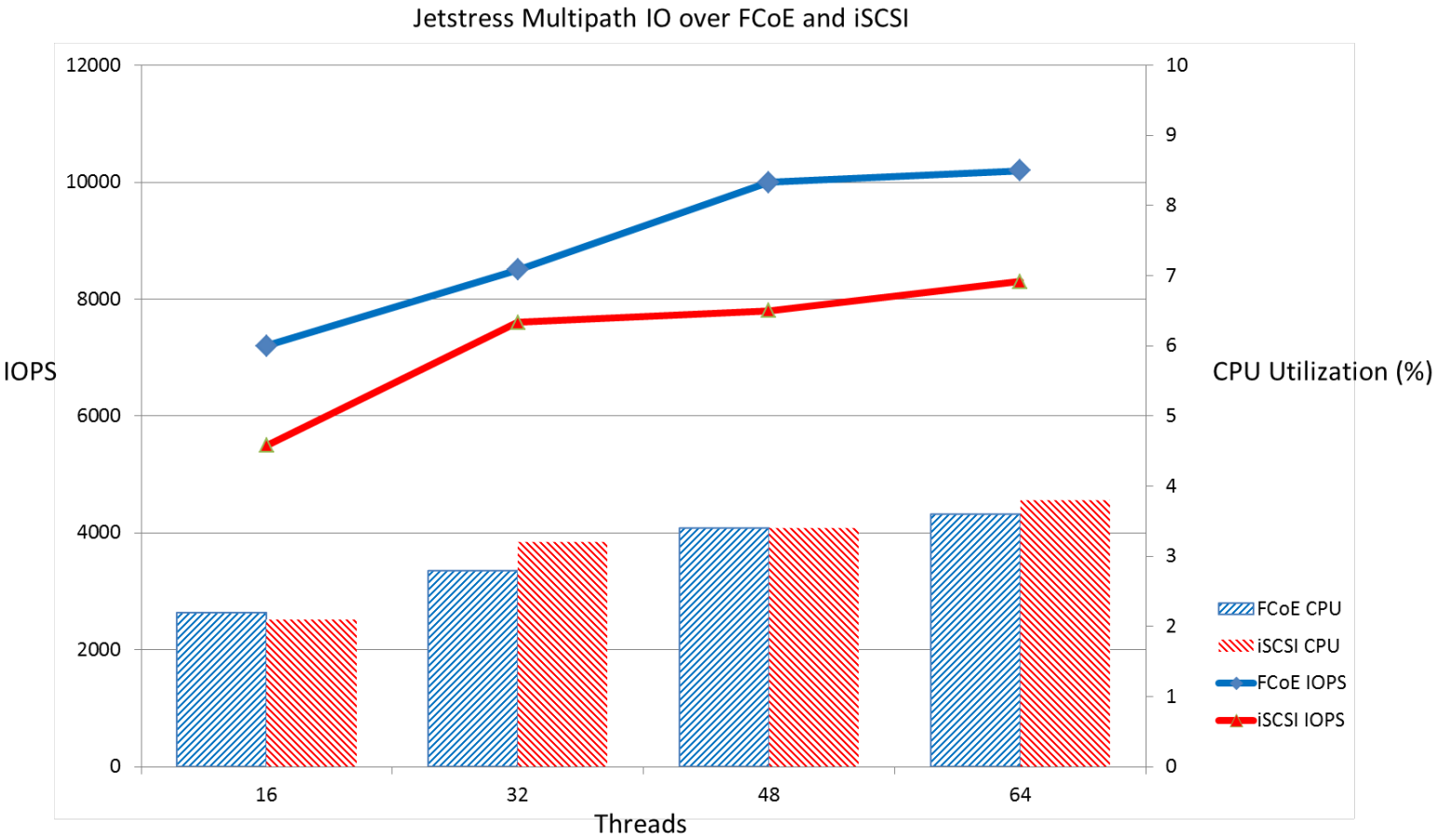
Performance Impacts

- FCoE outperforms iSCSI in most cases
  - Encapsulation
  - Hardware offloading
  - Frame size
- Wire performance delta is minimal
  - Software initiator vs hardware offload will impact server load, but minimally
- Most servers and storage systems are bottlenecks before protocols are a factor
- DCB offers more predictable latency over traditional IP networks, a benefit in mixed traffic environments

Resource Utilization

- Two approaches to protocol handling
  - Full offload – adapter handles protocol stack – lower CPU utilization
  - Host-based – selective hardware acceleration levels – higher CPU utilization
- Can make difference in acceptable application performance in edge cases on older servers
  - OLTP databases
  - Big Data applications
  - Undersized Server
- CPU utilization differences getting smaller everyday

IOPS and CPU Utilization for FCoE and iSCSI



Graph of data from Demartek Report

Intel® 10GbE Adapter Performance Evaluation for FCoE and iSCSI – September 2010

Skills and Support

- Availability of tools
  - Most FC admin and troubleshooting tools work with FCoE
  - IP network tools can troubleshoot iSCSI the same as other protocols
  - Most iSCSI problems can be solved with “ping” command.
- Availability of admins experienced in either
  - iSCSI admins are generally easier to find
  - FC network admins are less common than IP network admins, but transition to FCoE fairly easily
  - Market forces drive salary and availability

Conclusion

- Either protocol can satisfy most technical requirements.
  - Extreme throughput requirements push towards FCoE.
  - Extremely low latency tolerance push towards FCoE.
  - Less than 800 Mbytes/sec per port = either will work
  - Long distance requirements push towards iSCSI
- Non-technical factors often drive the decision.
  - Budget impacts
  - Personnel availability
  - Supportability in a particular environment
  - Application support
- Non Factors
  - CPU Utilization – becoming less relevant over time (Moore's law ramifications)

Conclusion

SNIA Education

QUESTIONS?

Tutorial Preparation Guidelines

- Large size slide page number is deliberate
  - Easier for audience to follow from handouts
- Keep slide-count to amount you can cover in time allotted
  - Maximum 40-45 slides for 60-minute session
  - Maximum 30-35 slides for 45-minute session
  - Title, boilerplate (e.g. legal, Attribution & Feedback contents, and 'separator' slides don't count against limit
  - You may have extra slides in an Appendix (max. of ~30% extra)
- 3 levels of bullets maximum
  - 4 to 6 Bullets: use 2 column text slide
  - Use www.snia.org scheme colors for hyperlinks
- AVOID
  - Moving or resizing the text area
  - Changing fonts, point sizes or spacing
- Use color, bold and *italics* for emphasis

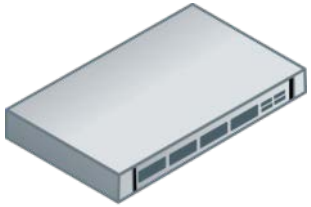
Tutorial Preparation Guidelines (cont.)

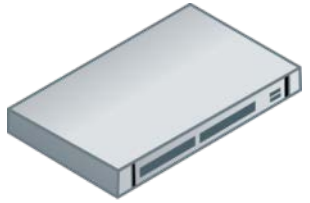
- Title Slide: List the presentation title, presenter name/company name; if a co-presenter, list name/company name (no email addresses).
- Always include: Legal, Abstract, and Attribution & Feedback slides (do not delete these slides)
  - Legal slide is #2 slide
  - Abstract Slide is #3: View the sample abstract in "SNIA Tutorial Preparation Guidelines" presentation and modify your abstract to fit that format.
  - Attribution & Feedback (authorship history & contributors) is the final slide before any appendix
- Please try to stay with template colors in case re-coloration is necessary.
  - For information on approved colors, view https://members.snia.org/members/Style%20Guide_07.pdf
- Run spell check when done
  - Choose Tools, Spelling in Powerpoint 97-2003
  - Choose Review, Spelling in Powerpoint 2007
- Save your presentation as a Powerpoint 2007.pptx presentation file
- Refer to the FAQ for SNIA Tutorials "General Information" at http://www.snia.org/education/tutorials/faq/

Graphics


Ethernet Switch


Ethernet Router


FC Switch


FC Router


Disk Enclosure

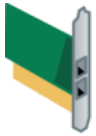

NAS Appliance

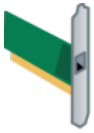

Storage Array


Server

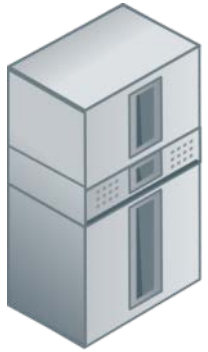

Protocol Converter


Disc Drive

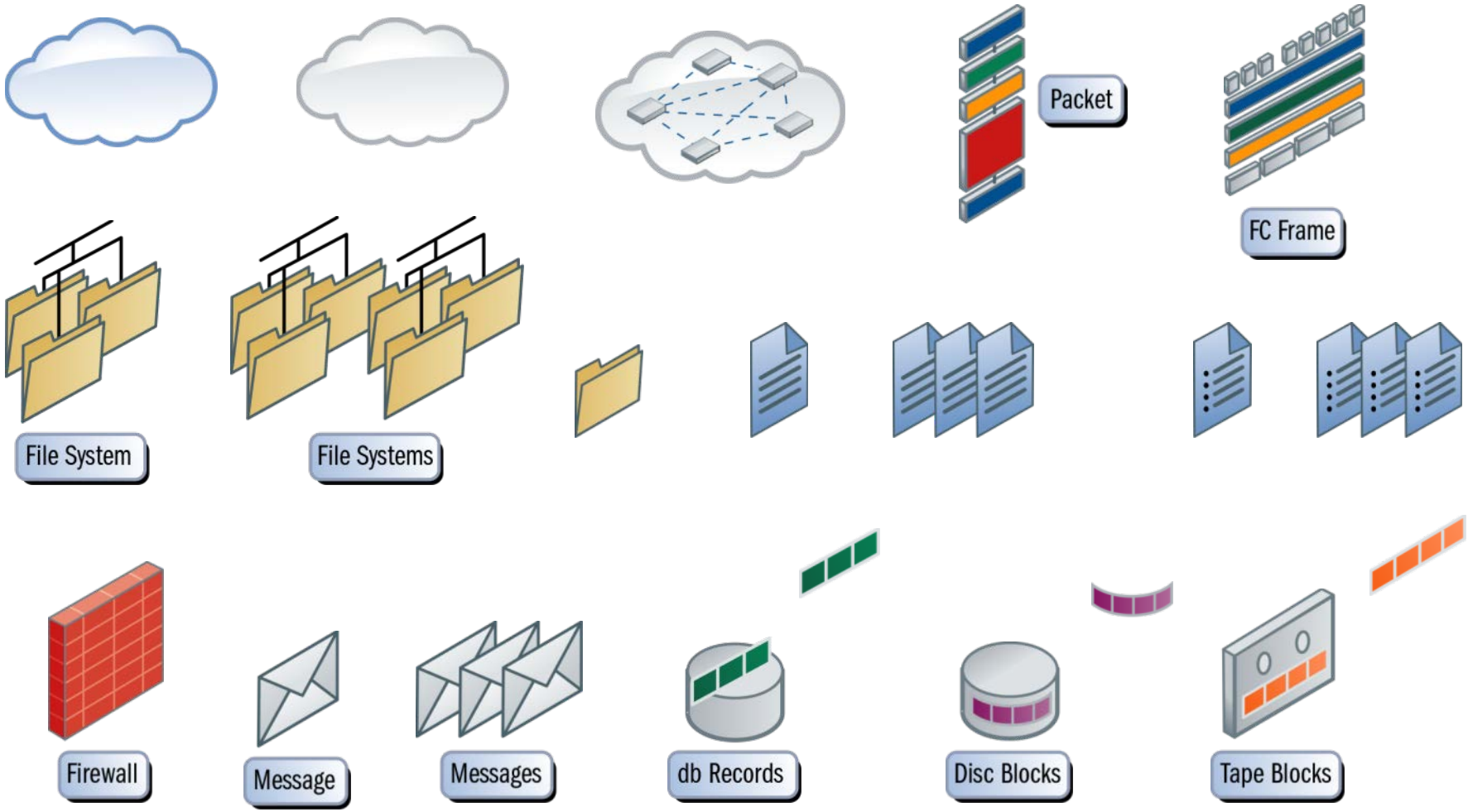

HBA


NIC

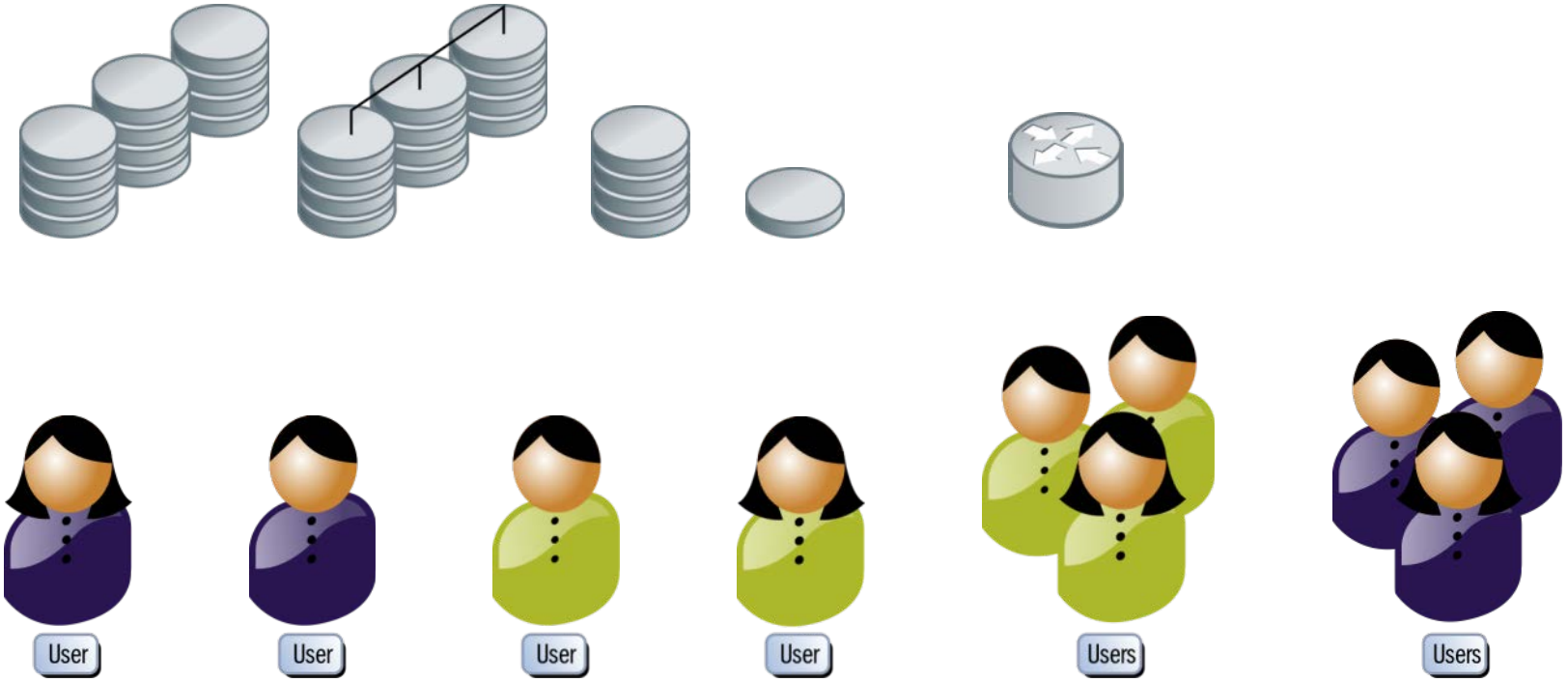

Storage Media Library


Storage Media Library

Graphics



Graphics



Refer to Other Tutorials

- Use this icon to refer to other SNIA Tutorials where applicable

Check out SNIA Tutorial:

Enter Tutorial Title Here

- Use the Hands-On Lab icon only if you've been notified that your tutorial is a cross-referenced match to the Hands-On Lab

Hands-On LAB COMPUTERWORLD SNIA SNW

Attribution & Feedback

The SNIA Education Committee thanks the following individuals for their contributions to this Tutorial.

Authorship History

Name/Date of Original Author here:

Updates:

- **Name/Date**
- **Name/Date**
- **Name/Date**

Additional Contributors

Name of contributor here
Name of contributor here
Name of contributor here
Name of contributor here
Name of contributor here
Name of contributor here
Name of contributor here
Name of contributor here

Please send any questions or comments regarding this SNIA Tutorial to ***tracktutorials@snia.org***