ATTO Technology 10 Gigabit Ethernet Network Adapter Configuration Guide

Jason Danielson and Lee Sulzberg, NetApp,
Melissa Carlson and Ken Seibert, ATTO Technology, Inc.
December 2015 | TR-4483

Abstract

This document describes the integration and configuration of ATTO ThunderLink NS 2101, NS 2102, and NT 2102; FastFrame NS11, NS12, and NS14; and FastFrame NT11 and NT12 with the NetApp® FAS8000 series.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1   Introduction

NetApp FAS8000 series systems are used in many media production and streaming deployments. This guide covers performance tips related to the installation of the ATTO FastFrame and Desklink 10GbE network adapters plus client operating system tweaks for 10GbE performance. These tips are designed specifically to support the streaming data workflows, including playback of high-resolution video in media and entertainment workflows.

The intended audience includes customers who wish to configure the ATTO 10GbE family of network adapters for streaming workflows containing both a 10Gb-enabled FAS8000 series cluster and a 10GbE switch. This guide also covers the server and workstation configuration parameters that can prove useful to technical staff supporting clients using NetApp FAS storage and ATTO 10GbE network adapters.

2   ATTO and NetApp Solution

ATTO FastFrame PCIe 2.0 10GbE network adapters are ideal complements to media and entertainment workflows featuring the NetApp FAS8000 series of NAS devices. The FAS8000 series is easily deployed into existing media and entertainment workflows using standard file-sharing protocols over existing 1Gb and 10Gb network infrastructure. The ATTO 10GbE network adapter provides high-performance, low-latency network connectivity for Mac OS X, Windows, and Linux clients using standard file-sharing protocols such as SMB and NFS.

Media and entertainment workflows require flexible tools that protect your storage investment. NetApp and ATTO Technology provide flexible tools based on open protocols. A workflow based on open network file-sharing protocols and the effortless scalability of NetApp storage enables media and entertainment professionals to rapidly adapt to changing production requirements. These professionals can also adapt to ever-increasing content storage requirements and increasingly complicated workflows.

The ATTO 10GbE adapter is your gateway to high-performance NetApp FAS storage. Properly tuned 10GbE networks give FAS users the ease of use of a shared network volume and throughput previously restricted to complicated FC SAN environments. FAS8000 series enclosures and ATTO 10GbE network adapters provide reliable performance for even the most demanding media and entertainment workflows.

The FastFrame NS11, NS12, and NS14 network adapters are 1-, 2-, and 4-port SFP+ 10GbE PCIe 2.0 compliant network interface cards optimized for high-performance access to media storage workflows on a local area network. The ATTO ThunderLink NS 2101 is a 1-port SFP+ network adapter with Thunderbolt 2 connectivity. The ATTO ThunderLink NS 2102 is a 2-port SFP+ network adapter and the NT 2102 is a RJ45-based network adapter with Thunderbolt 2 connectivity for workstations without PCIe expansion slots. The ATTO proprietary Advanced Data Streaming (ADS) technology manages network latency to provide high-performance media file transfers and reliable playback of streaming media.

3   Guidelines

3.1   Client Configuration

For the best performance, install the FastFrame 10GbE network adapter in a PCIe 2.0 or 3.0 slot that is electrically wired for an eight-times-or-greater lane width. Table 1 demonstrates the bandwidth limitations of PCIe 1.0 versus PCIe 2.0 at varying lane widths.

Table 1) PCIe bandwidth.

Lanes	Bandwidth per Direction PCIe 1.0	Bandwidth per Direction PCIe 2.0
1	250MBps	500MBps
2	500MBps	1GBps
4	1GBps	2GBps
8	2GBps	4GBps

Make sure that your clients run current OS patch levels and the latest version of the ATTO FastFrame 10GbE NIC drivers. The latest ATTO drivers can be found here www.attotech.com/downloads.

For best performance, when installing the ThunderLink NS 21xx or NT 2102 device, make sure that the device is the only one on a dedicated Thunderbolt 2 bus. As an example, on the Apple Mac Pro (late 2013), use either port 1 or port 3. Bear in mind that port 2 shares the same bus as port 1, port 4 shares the same bus as port 3, and ports 5 and 6 share a bus with the HDMI display interface. See the Apple Knowledge Base article HT202801 for more information.

In Figure 1, each of the three Thunderbolt 2 buses in the Apple Mac Pro has a dedicated bandwidth of 5Gbps from the system's PCIe controller.

Figure 1) Image from Apple KB article HT202801.
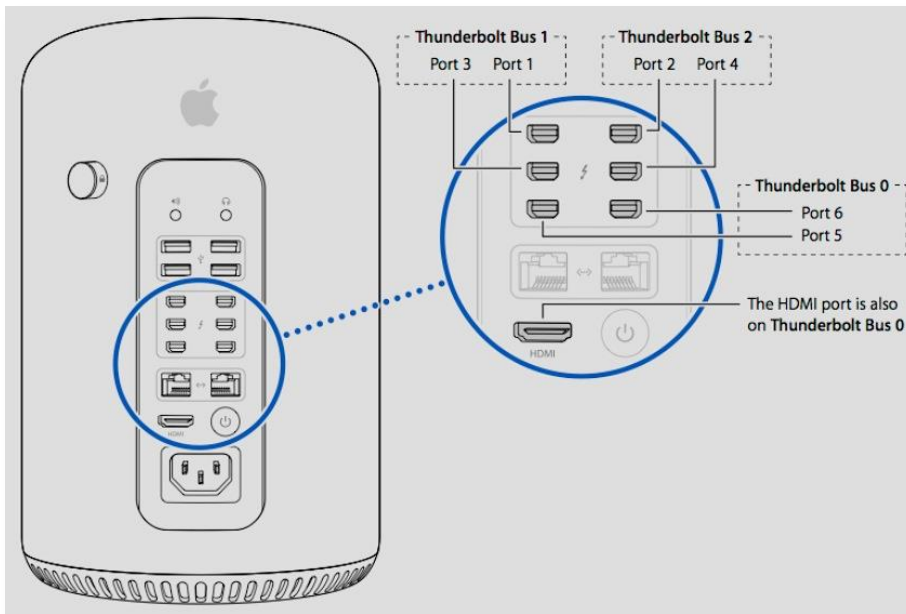
For optimal 10GbE performance, the following are added to the file `/etc/sysctl.conf` on clients running Linux or Mac OS 10.9 and greater when the Use optimized network settings checkbox is selected upon driver installation:

`net.inet.tcp.sendspace=1048576`

`net.inet.tcp.recvspace=1048576`

`net.inet.tcp.delayed_ack=3`

`net.inet.tcp.rfc1323=1`

The `net.inet.tcp.sendspace` and `net.inet.tcp.recvspace` system control values determine the client OS transmit and receive buffer sizes.

The `net.inet.tcp.delayed_ack system` control determines when TCP delayed acknowledgment is enabled. The system control is changed from the default value of 0 (no delayed acks) to 3 (autodetect).

Jumbo frames support for the ATTO Technology FastFrame and ThunderLink 10GbE network adapter is enabled using the Mac OS X network preferences pane.

3.2   NetApp FAS Configuration

The FAS8020 was connected to two DS2246 disk shelves. One DS2246 disk shelf contained 24 Hitachi 600GB SAS drives. The other DS2246 disk shelf contained 24 Toshiba 900GB SAS drives. The FAS8020 was then connected optically to a 10GbE Cisco switch. Three host devices running three different operating systems were tested.

The FAS8020 was configured with a 40-disk aggregate that contained two 20-disk NetApp RAID DP® groups. Two 3-disk aggregates were created as the root aggregates. The FAS appliance used the NetApp Data ONTAP® operating system version 8.3 RC2. From the cluster, a storage virtual machine (SVM) was created. The SVM's allowed protocols were NFS and CIFS. Two 30GB volumes were created for NFS and SMB testing.

For complete installation and setup instructions for the FAS8020, see the [FAS8020 Setup Instructions](#).

3.3   Mac OS X Tuning

In Mac OS X, the default read/write size for an NFS volume is 32K. To increase performance, NetApp and ATTO recommend mounting the NFS volume with a 64K read/write size. To do so, you need to mount the volume manually through the CLI by using the following syntax (single-line command):

```
sudo mount –t nfs –o resvport, rw, rsize=65536, wsize=65536, [IP Address]:/[volume name] /mnt
```

Mac OS X needs the option `resvport` to be present when mounting; otherwise a message will appear stating `Operation not permitted`.

3.4   Windows Tuning

The Windows TCP stack is largely self-tuning and requires little tuning when the FastFrame NS 10GbE network adapter is installed. NetApp and ATTO recommend using a 64-bit operating system such as Windows 7 x64 or Windows Server 2012 R2 when deploying the FastFrame NS 10GbE network adapter. In the Advanced tab of the network adapter properties, make sure that the `Receive Side Scaling (RSS) Queues` value matches the number of available CPU cores in the host computer. If the host computer runs a particularly CPU-intensive application, the RSS queues are optionally left at the default value of 1.

In the "Performance Options" section of the FastFrame network adapter properties, increase the `Transmit and Receive Buffers` from the default value of 512 to 4,096. Larger transmit and receive buffers improve the reliability of certain media playback and ingest applications by caching data in the

host computer system memory during periods of network latency. Enable `Large Send Offloads` and RSS in the Advanced tab of the network adapter properties and in Windows with the command `netsh int tcp show global` in the Windows command prompt.

4 Conclusion

Today's file-based media and entertainment workflows create significant challenges for operations using traditional storage and networking technologies. NetApp FAS enclosures running clustered Data ONTAP provide a flexible, easy-to-manage storage platform with bandwidth sufficient for these workflows. These tests were run with a minimal number of SAS drives in the FAS configuration to allow extrapolation to real-world aggregate-bandwidth requirements. The focus of these tests was to test and tune for single-stream performance over a 10GigE network. From ingest to edit, transcoding, streaming media, and archive, NetApp FAS alongside ATTO Technology provides a storage solution for every workflow within a single file system.

4.1 Findings

In tables 2 through 10, we see the single-stream test results from the popular AJA System Test utility for Windows and Mac OS X. Iperf was used to test the performance in Linux. As you see, the ATTO FastFrame 10GbE adapter provides a significant performance advantage over a standard onboard Gigabit Ethernet interface. The single-stream performance of a properly tuned 10GbE interface easily accommodates some of the most challenging HD and 4K editing workflows.

Table 2) 10GbE Mac OS X 4K single-stream SMB performance with ThunderLink NS 21xx and NT 2102.

4096X2160 10-Bit RGB	Read	Write
Version 1.0	Read	Write
10.10.4	410MBps	223MBps
10.10.11	402MBps	450MBps

Table 3) 10GbE Mac OS X HD single-stream SMB performance with ThunderLink NS 21xx and NT 2102.

1920X1080 10-Bit RGB	Read	Write
Version 1.0	Read	Write
10.10.4	406MBps	219MBps

Table 4) 10GbE Mac OS X 4K single-stream NFS performance with ThunderLink NS 21xx and NT 2102.

4096X2160 10-Bit RGB	Read	Write
Version 1.0	Read	Write
10.10.4	430MBps	792MBps
10.10.11	450MBps	708MBps

Table 5) 10GbE Mac OS X 4K single-stream SMB performance with FastFrame NSxx and NTxx.

4096X2160 10-Bit RGB	Read	Write
Version 1.0	Read	Write
10.10.4	400MBps	230MBps

4096X2160 10-Bit RGB	Read	Write
10.10.11	427MBps	352MBps

Table 6) 10GbE Mac OS X HD single-stream SMB performance with FastFrame NSxx and NTxx.

1920X1080 10-Bit RGB	Read	Write
Version 1.0	Read	Write
10.10.4	431MBps	225MBps

Table 7) 10GbE Mac OS X 4K single-stream NFS performance with FastFrame NSxx and NTxx.

4096X2160 10-Bit RGB	Read	Write
Version 1.0	Read	Write
10.10.4	220MBps	310MBps
10.10.11	200MBps	390MBps

Table 8) 10GbE Windows 4K single-stream SMB performance with FastFrame NSxx and NTxx.

4096X2160 10-Bit RGB	Read	Write
Version 1.0	Read	Write
Windows 7	628MBps	351MBps
Windows 8.1	653MBps	350MBps
Windows 10	627MBps	347MBps
Windows 2012 R2	641MBps	351MBps

Table 9) 10GbE Windows HD single-stream SMB performance with FastFrame NSxx and NTxx.

1920X1080 10-Bit RGB	Read	Write
Version 1.0	Read	Write
Windows 10	358MBps	346MBps

Table 10) 10GbE Linux single-stream NFS performance with FastFrame NSxx and NTxx.

4096X2160 10-Bit RGB	Read	Write
Version 1.0	Read	Write
Fedora 20	427MBps	352MBps

References

For additional information about FastFrame 10GbE adapters, see the ATTO FastFrame Product Manual.

Refer to the [Interoperability Matrix Tool (IMT)](#) on the NetApp Support site to validate that the exact product and feature versions described in this document are supported for your specific environment. The NetApp IMT defines the product components and versions that can be used to construct configurations that are supported by NetApp. Specific results depend on each customer's installation in accordance with published specifications.

■ NetApp®

www.netapp.com