White Paper

BUFFALO™

FOR IT ADMINISTRATORS, DECISION-MAKERS, AND OWNERS OF SMALL TO MEDIUM-SIZED BUSINESSES

No More Waiting Around

How 10 Gb/s Will Change Your Company Network

10 GbE – NETWORK UPGRADE FOR SMB

Introduction

There's nothing more annoying than having to wait around somewhere – whether in a traffic jam, at the supermarket checkout, at the subway station, being kept on hold on the telephone, or at your office computer. Applications that freeze, unresponsive apps, files that are slow to load – all of these make your work tedious, frustrating, and inefficient.

So who or what is to blame? In short, it is usually new applications that use a lot of bandwidth, or applications that need a lot of memory, which hold up data traffic on the network. IT administrators at companies must promptly see to it that these new applications do not cause the data transfer rate and server response times to plummet.

This situation is a hot topic right now given the arrival on the market of a large number of new technologies and business-critical applications that increase the productivity of companies, but also place a great strain on their networks. The good news is that roughly one third of companies have realized the situation and already implemented a 10 Gb/s network infrastructure using Ethernet, with three-quarters expected to have done so by next year.

The Unavoidable New Bandwidth Guzzlers That Are Holding Us Up

1. Server virtualization is the first source of problems we need to look at. Virtualization makes it possible to run more applications on fewer servers at the data center. Fewer servers mean less space and cooling is required, and they consume less power. This saves money, but soon has an impact on the bandwidth on the network, as consumption of this increases.

2. Voice and video over IP applications are some of the biggest guzzlers when it comes to bandwidth. There is nothing more disruptive than when a video lags or your voice breaks up during a video conference, after all.

3. People are never happy to replace old computer equipment while it is still working, but in many cases it is this that is contributing to delays on the IT network. Conversely, modern PCs nowadays have a 1 Gb/s network connection and these place a greater strain on a company's network as a whole.

4. For many companies it remains a dream for the future, but the arrival of the Internet of Things (IoT) is inevitable. In IoT environments, connected devices and sensors send millions of data packets to central servers and storage units, who then send these back to the end devices, which have to analyze and evaluate them.

5. Last but not least, these extremely large amounts of data have to be backed up, replicated and, where necessary, restored. This can take some time. There are allegedly still companies who only back up their data once a week, at the weekend, because one night is not long enough to run a full backup.

## We Want a Faster Network – Moving from 1 Gb/s to 10 Gb/s

It's fair to say there is a multitude of reasons for trimming the company network to make it faster. In the past, a 1 Gb/s bandwidth on the network offered the best cost/performance ratio, but there is now cost-effective 10 Gb/s equipment available that makes it possible to multiply network output without having to increase the IT budget too much. The following section outlines the measures and devices that will speed up networks.

Patch Cable Categories			
Category	**Description**	**Field of Application**	**Class**
Cat1	For voice and data transmission at frequencies of up to 100 kHz. Suitable for transmission in telecommunications only.	ISDN basic rate access, RS-232	A
Cat2	For voice and data transmission at frequencies of between 1 and 1.5 MHz. Suitable only for transmission in ISDN telecommunications using house wiring.	ISDN	B
Cat3	For voice and data transmission at frequencies of up to 16 MHz. Mainly used for telephone cabling in the USA.	10Base-T, token ring, ISDN	C
Cat4	For voice and data transmission at frequencies of up to 20 Mbit/s. Also very common in the USA, although category 5 now favored.	16 MBit/s, token ring	C
Cat5	Cat5 cables are designed for voice and data transmission at frequencies of up to 100 MHz, across distances of up to 100 m. Category 5 cables are suitable for Ethernet (100 MBit/s). Of the four pairs of wires, only two pairs are used.	100Base-T	D
Cat5e	As an upgrade of the Cat5, the Cat5e cable (enhanced) has better transmission properties and can achieve Gigabit Ethernet transmission rates of up to 1000 MBit/s using all four pairs of wires.	1000Base-T	D
Cat6	Cat6 cables are designed for voice and data transmission at frequencies of up to 250 MHz, across distances of up to 100 m. The 250 MHz frequency transfers a higher volume than the Cat5e, but only at up to 1 GBit/s.	155 MBit/s, 1000Base-T, *ATM	E
Cat6a	Cat6a cables are designed for voice and data transmission at frequencies of up to 500 MHz, across distances of up to 100 m. Category 6a cables achieve Gigabit Ethernet transmission rates of up 10 GBit/s.	10GBase-T, *ATM Gigabit Ethernet	E
Cat7	For voice and data transmission at frequencies of up to 600 MHz. These cables make *ATM 622 MBit/sec. transmission possible, and provide ample reserve power for all currently available IT networks. It makes sense to use these nowadays if data cables are being used for video conferences and image transmission systems.	622 MBit/s, *ATM Gigabit Ethernet, 10GBase-T	F

1. Cabling – The first step is to check the network cabling at your company to ensure suitability for 10 Gb/s. The following table shows that CAT6a or CAT7 cables, which enable transfer across distances of up to 100 meters, are required for transmission at 10 Gb/s

2. Servers – If your server does not have 10 Gb/s connections, you can find a large selection of NICs (Network Interface Cards) on the internet. These cost between 200 and 300 euros per card.

3. Switches – A large selection of switches is available, offering a wide range of functions, depending on your own requirements, and costing up to 20,000 euros. When switching to a 10 Gb/s environment, it is best to use switches that have a basic range of functions and are easy to install (i.e. plug & play), priced at 550 euros upwards.

4. Storage Systems – The NAS systems you use should of course have a 10 Gb/s connection as well as a fast processor and sufficient RAM so that the data can be processed quickly – whether on the file server or during backup.

A simple example of 10 Gb/s being
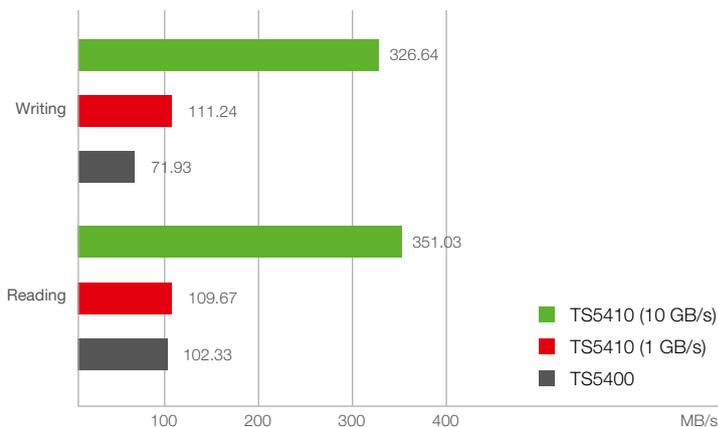implemented is illustrated below:
The central servers are connected to the central
switches with 10 Gb/s lines, even though the user's end
devices connected to the edge switches have 1 Gb/s.

NAS File Server

Server

NAS Backup

10 Gb/s

10 Gb/s

10 Gb/s

10 Gb/s

Edge Switches 1 Gb/s
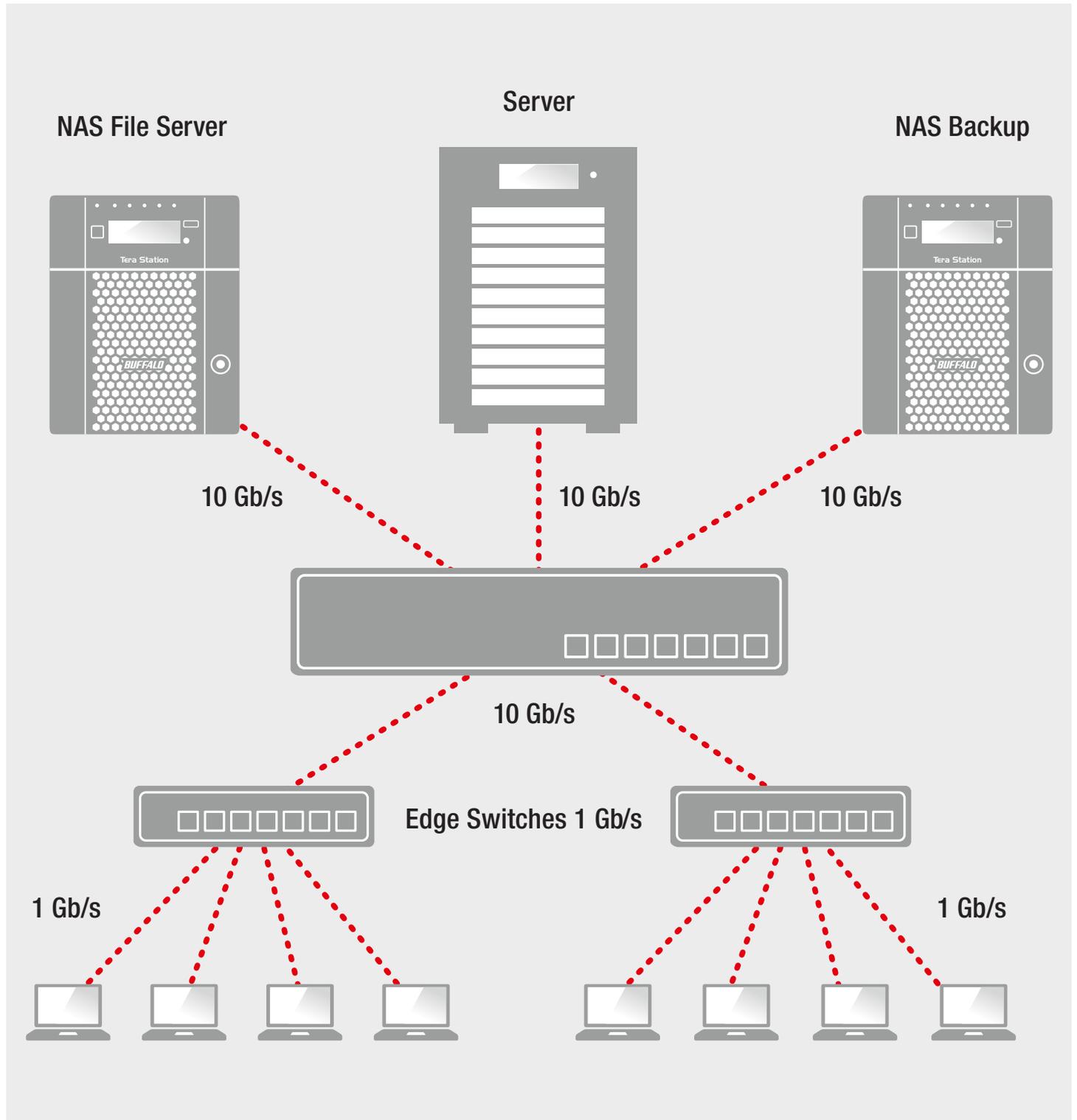
1 Gb/s

1 Gb/s

How Fast It Gets

The graph to the right shows you how the speed increases when using 10 GB/s connections, contrasting this with the 1 GB/s transmission speed. In our laboratory, we compared the write/read speeds with the TS5410, our latest NAS model, to its predecessor, the TS5400. This revealed that the 10 Gb/s connection is around three times faster than the 1 Gb/s line, and also that our top model of NAS achieves much faster speeds than its predecessors.

Speed Increase in a RAID 5 Configuration

Writing
- TS5410 (10 GB/s): 326.64
- TS5410 (1 GB/s): 111.24
- TS5400: 71.93

Reading
- TS5410 (10 GB/s): 351.03
- TS5410 (1 GB/s): 109.67
- TS5400: 102.33

Legend:
- TS5410 (10 GB/s)
- TS5410 (1 GB/s)
- TS5400

Axis: 100 200 300 400 MB/s
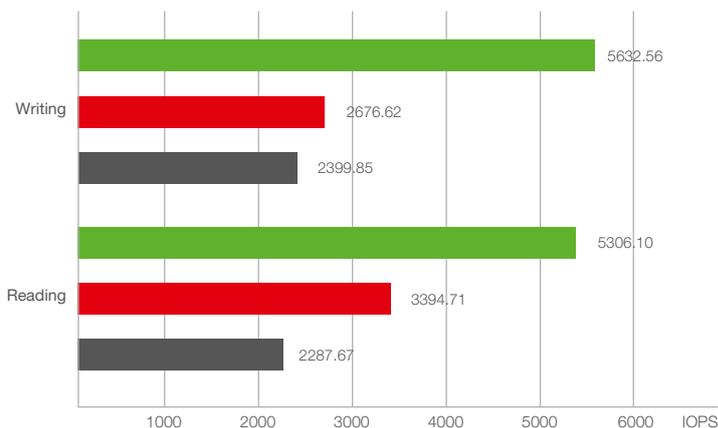
Test Environment
CPU: Intel Core i7 4771; M/B: Intel H87 chipset (MSI H87-G41); MEM: PC 1600 DDR3 8 GB x 4;
NIC: Intel Gigabit CT Desktop (for 1 Gbps) / Intel X540-T2 (for 10 Gbps); OS: Windows Server 2012 R2 64 bit

In practical terms, this means (for example) that it takes much less time to back up company data, such that a full backup of 3 TB data can be carried out overnight.

	TS5400D	TS5410D
1 TB	3 h 29 min	2 h 30 min
3 TB	10 h 27 min	7 h 30 min
5 TB	17 h 25 min	12 h 30 min

Rapid increases are also achieved in virtualized environments. The iSCSI protocol benefits from the additional bandwidth on the network and can run more virtual machines. Our tests prove that more than double as many write IOPS and more than 50% read IOPS are performed via iSCSI with a 10 Gb/s connection, compared to a 1 Gb/s connection.

Greater IOPS via iSCSI in a RAID 5 Configuration

Writing
- TS5410 (10 GB/s): 5632.56
- TS5410 (1 GB/s): 2676.62
- TS5400: 2399.85

Reading
- TS5410 (10 GB/s): 5306.10
- TS5410 (1 GB/s): 3394.71
- TS5400: 2287.67

Axis: 1000 2000 3000 4000 5000 6000 IOPS

Legend:
- TS5410 (10 GB/s)
- TS5410 (1 GB/s)
- TS5400

Test Environment
CPU: Intel Core i7 4771; M/B: Intel H87 chipset (MSI H87-G41);
MEM: PC 1600 DDR3 8 GB x 4; NIC: Intel Gigabit CT Desktop (for 1 Gbps) /
Intel X540-T2 (for 10 Gbps); OS: Windows Server 2012 R2 64 bit

1 NAS for 50 PCs

We also tested how many PCs can access the TS5410 via the network without the speed dropping. In our test configuration, the end devices were backed up to the NAS on an ongoing basis, with videos streamed to other end devices at the same time. Files were copied, read and deleted also. It took 24 hours to conduct the test, with the number of connected PCs continually increased as long as the test program continued to run without any errors and interruptions.

Using the 10 Gb/s connection made it possible to increase the number of "participating" PCs with simultaneous access to the NAS from 40 to 57.

As such, Buffalo switches and the new Buffalo TeraStation 5410 is an ideal product combination for small and medium-sized businesses and for branches and subsidiaries. Advertising agencies, music studios, and architect's offices (i.e. small teams) who need access to large amounts of data every day and have limited IT budgets at their disposal really stand to gain.

The BS-XP2000 Switch Series	The Buffalo TeraStation 5010 Series
■ 8 (or 12) x 10 GbE connections	■ Annapurna Labs® Quad Core 1.7 GHz CPU
■ 802.3az Green Ethernet technology	■ Working memory (RAM) DDR3 ECC 4 GB
■ Automatic energy-saving function reduces overall power consumption	■ Hard disk interface SATA 6 Gb/s
■ Auto MDIX makes fast plug & play setup possible with any Ethernet cable	■ Supported RAID modes JBOD, 0, 1, 5, 6, 10
■ Robust metal housing	■ Hot swap
■ Loop prevention or detection (depending on model)	■ Linux operating system
■ VLAN management	■ Number of bays 2, 4
■ QoS	■ Total capacity 4 TB, 6 TB, 8 TB, 12 TB, 16 TB, 24 TB, 32 TB
■ Link aggregation	■ LAN connections 1 x 10 GbE, 2 x 1 GbE
■ IGMP snooping	■ 2 USB 3.0 connections
■ Data traffic management	■ Standard three-year warranty, 24h hard disk replacement, technical service hotline
	■ iSCSI
	Supported operating systems:
	■ Windows® 10 / 8.1 / 7; Windows Server® 2012 / R2 / 2008 / R2 / 2003 R2; Mac OS® X 10.9 or later
	■ Apple Time Machine®
	■ Cloud support

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