

1909160 Computer Arch. Assignment Report

by Mark Vaughan

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Computer systems and components specification

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Abstract

This document is the result of the ongoing COVID-19 pandemic. In the normal course of events, the Computer Architecture module would result in an in class test. However, due to the restriction currently in force, this is no longer possible. Therefore, a written assignment was implemented as a replacement evaluation. This is the authors modest application of work to that end.

1. Description of the requirements

The assignment consists of the creation of two design specifications for personal computers (PC) that fulfil two different requirements.

The first specification is for the use by an elderly relative for the purposes of basic writing, viewing YouTube video and communicating with family members via video conferencing. For the purposes of the report, this will be referred to as the Granny – PC.

The Second specification is more involved. It consists of two parts. The primary component is the design of a video editing workstation that will make use of unspecified software to edit and produce

video footage up to 4K resolution at near real-time speeds. The second part is the local data storage array in the form of a Network Attached Storage (NAS) box which initially will hold an 8TB storage capacity with the ability to expand the capacity up to 56TB as required. The specification also states a figure of £2,500 as the budget for the build. Around a £150 margin is allowed to provide some adjustment of hardware choices within, the overall design specification. This specification will be referred to as the Video-PC for this report. For clarity, a copy of the requested design specifications may be found in appendix 2 Appendixes one and two will hold the hardware specifications and costs in the form of screenshots from the authors favoured component vendor.

The assignment requirement makes some assumptions concerning the existing hardware for use by the new computers and have not been included in the specifications listed. There is no mention made of the software to be used. In light of this, no consideration is made for the type of operating system or applications used. This fact will mean that the specification can be implemented with a wide range of operating systems and applications. The default assumption made by the author is that Microsoft Windows will be used and the use of a mainstream web browser such as Chrome© will be used. Again, as with the hardware specification, the inclusion of software in the specifications has been omitted.

2. Design Specification: Granny-PC

It is an axiom of design that form follows function. This is just as applicable for PC's as it is for lawnmowers. The first step in formulating a specification for the Granny – PC is to determine its function. In this case, it has to process video feeds, perform basic application processes like text and picture manipulation and act as a messaging tool for use with email or video casting. All of these functions are well within the range of the most basic

of modern computer hardware so, for this design, the requirements are functionally quite modest. They do not require a more sophisticated solution.

The heart of any computer system is the motherboard. For this design, the author has chosen a pre-built system from the Xenta line, Xenta being the brand name for Ebuyer's range of equipment. The choice was made partially on cost and partially on the specification provided as standard. Ready built systems often provide an extremely good cost/feature ratio. With this build, the motherboard is outfitted with eight GB of random-access memory that will allow most mainstream applications to run without reducing performance by excessive page swapping caused by the lack of available memory. Being DDR4 specification the memory modules offers respectable operating speeds, minimising wait states on the central processing unit (CPU) and Memory bus controller. Having a good memory is only one half of the motherboard equation. The other half is the CPU itself.

The choice of this particular model of pre-built computer was decided by the use of an AMD A10-9700 processor. This processor is one in the latest line of Fusion processors. These have been designed with a core that uses four processing cores with on-die video graphics and memory controller. This construction allows for very fast communication between memory, video and processors without the functional bottlenecks that are caused by having discrete board mounted bus controllers. By having the major components built into the main processor die, the cost of production is reduced, and functional efficiency is increased, and the motherboard design can be simplified and made more reliable because of the reduced component count.

For storage, the computer has a 240GB solid-state device (SSD) as standard. This not only provides a fast load time for the operating system by virtue of not having any mechanical components, but it also is very reliable in operation. However, it does have limitations when it comes to read-write operations and will become less efficient over time. With this in mind, a more traditional two-and-a-half-inch disk drive was added to the specification. The idea is to use the SSD for a read-only operation to maintain efficiency and the 2TB disk being used to hold paging files, user data and OS configuration files.

As in-line computational speed is not a factor in this specification, this division of storage offers the best performance overall with a slightly lower storage performance. The motherboard has additional features that lend themselves to the functional requirements; these include a 1Gb ethernet adaptor, an integrated 802.11n wireless network adaptor

USB 2.0 and 3.0 ports for peripherals and a high quality 7.1 sound processor subsystem with a SPDIF optical connector. This will allow the owner to easily connect to any home internet router either wirelessly or in a wired configuration and provides high-quality sound and vision up to and including the newest 4k standard.

The design specification also provides for a 27" led monitor with integrated speakers. This makes for a tidy and functional display with bright and sharp image definition at its native resolution of 1920x1080. The refresh time of 1 millisecond also provides clear blur-free playback even in the most rapidly changing images, ideal for video playback.

For convenience, a wireless keyboard and mouse have been provided for maximum flexibility in use and with up to eight months of battery life, requires little maintenance. An additional item is the external DVD reader/writer. This delivers the dual functions of being a method of playing back dual-layer DVD's such as store-bought movies and burning DVD-R/DVD+R disks to archive documents and images from the computer. It should be noted that this is not suitable for drive imaging and backup due to the limited storage capacity of 4.3 GB per disk and slow-burning times.

One notable omission on the list is the lack of a webcam for video conferencing. This is due to the vendor not having suitable stock listings. For the purpose of the specification, a good basic choice would be the Trust Exis webcam with a built-in microphone and when added to the cost of the listed items brings the total up to £460.32.

3. Design Specification: Video Editing PC

The second design specification is for the video editing pc. Unlike the Granny-PC, the functional requirements for this machine are far more demanding. Video editing primarily requires the ability to move data from storage to memory and back again at high speed. The process also requires a high degree of computing power to handle both video data and soundtracks in real-time and where special effects are concerned, the ability to manipulate 3-D objects such as text or logos.

As with the first specification, the motherboard will be looked at first. For this specification, the choice of motherboard goes to the Asus Republic Of Gamers STRIX BF450-X. This motherboard was chosen for several reasons. Firstly, the design of Gaming motherboards has the same basic criteria as Video editing specifications, namely bus transfer speeds and raw computing capacity. Secondly, the BF450 chipset that is main control chipset for this board is ideally suited for the Third generation

Ryzen Chip which is the choice of processor for this specification.

Thirdly, the motherboard has one very useful feature in the form of dual M.2 Connectors that permit the mounting of high-speed M.2 Solid-state storage devices. These will be most useful as twin editing drives for video media as they are directly connected to the version 3.0 PCI-E data bus, which is not affected by memory interrupts from the normal drive control chipset. Video editors often process video clips from a source drive and store the results on the second drive, the use of two drives means that the data is transferred on separate channels avoiding potential collision events where a single data bus is involved—using the SD drives as 'Spooling' Storage has the additional advantage of being temporary. Once the editing is finished, the drives can be reformatted, which will reset the drives to near factory condition and will keep speed performance high for the life of the drive. It should be born in mind that like any storage device, it will suffer degradation in performance in time due to wear and tear.

The processor chosen for this specification is an AMD Ryzen-7 3700X. This is a third-generation processor based on the Zen architecture which is ideally suited for this purpose. The key feature of this chipset is the integration of the PCI-E 3.0 bus into the main processor die. That speeds up processing by removing the bottlenecks associated with onboard bus controllers. This processor has eight cores capable of handling sixteen threads providing a very good parallel processing capability than can be leveraged to processing large blocks of video data into smaller workloads speeding up overall video processing.

As video processing is memory intensive, it was decided to install 32GB of DDR4 2666Mhz in two 16GB dim modules. The memory will be installed in dual channel configuration, making the best use of the low CL16 latency timings for additional speed performance. The motherboard is capable of being expanded up to 128GB although to maintain the set price point; a 32GB capacity was chosen.

As previously mentioned, the computer will utilise two M.2 SSD's. For this, a pair of Intel 660P NVMe SSD modules were chosen. The size of 1TB will provide more than enough space for large editing projects, and the use of a Seagate Firecude 2TB drive will allow excellent local storage for the completed work. The drive is a hybrid drive that uses DRAM memory to buffer often used files making it useful for OS use as well as bulk storage of video files.

As storage is being discussed, the specification requirements call for the use of external storage for

backup and archival purposes. As video data files are always large and do not compress well, the connection to the storage unit needs to have a fast transfer rate in both read and write modes.

To fulfil this requirement and an additional network card was specified. The built-in 1GB network port is fine for 'normal' use but is inadequate for this purpose. Instead, a Startech, dual-port 10Gbe was added to the specification. This can have up to a 20 gigabit per second full-duplex transfer rate which can transfer data at 310 kilobytes per second or 18.164 gigabytes a minute. The choice of the Startech brand offers a good mix of quality and price as this manufacturer operates in the budget market but uses good quality components which in this case is Intel X540 network controller chipsets.

This same principle was also applied to the graphics card. For this specification, a PNY P630 Quadro graphics card has been chosen. This card has 2GB of GDDR5 memory that is a high speed and is of a size more suited for video processing. The Quadro chipset is considered one of the best choices for 2-D graphics work but, has 512 CUDA cores for 3-D calculations, making it suitable for 3-D processing as well. Connectivity is served by four mini-display port connections that can provide either DVI-D or standard display port connectivity for up to four monitors and is capable of running 4K or 5K resolution in real-time. As this card has a PCI-E-16 connector, It can run with a bandwidth of 80Gb/s which means that the card is capable of handling any amount of data that the CPU can throw at it and still have the capacity to spare.

The design choice of case and power supply is based on functionality and practicality. The power supply is a gold rated EVGA Supernova 850W unit. This PSU can deliver all the power the computer requires at full load and because of the supply capacity, will not suffer from heat build-up within the case because of over stressing of the inductive components in the power supply itself. For reliability, the author often chooses PSU's that are rated between 1.5- and 3.5-times maximum load requirements. The case Chosen is a Corsair Obsidian 750d full tower case. From experience, Corsair's case design is well thought out, highly functional and well-constructed with the capability of adding additional hard and optical drives later if required. The choice of a full-height tower case allows the computer to be located under as workstation or desk and the large interior volume allows effective cooling by the five 120/140mm fans.

Additional heat mitigation also comes from the internal case partition, which is designed to keep hot devices like the power supply and disk drives

separate from the rest of the case. The PSU is mounted on the bottom of the case. It allows cool air to be drawn from the base of the case with the hot air being expelled out of the back without entering the case itself. This cooling feature, combined with the magnetic dust filters, make the case easy to maintain and improves reliability.

The other half of the Video Editing specification is the system to store the edited footage. The choice of storage within this specification is to use as Synology 1618 Network-attached storage unit. This device is based around an Intel Atom C3528 processor running at 2.1Ghz with 4GB RAM fitted as standard. This design is a six-bay box capable of taking SATA 3.0 NAS drives in sizes from 2TB up to 16TB in a capacity giving a maximum capacity of 64TB which is more than the 56TB maximum specified. The unit can run the disks in either RAID-0, RAID-1, RAID-5, RAID-6, RAID-10 or in JBOD (Just a Bunch Of Disks) configuration.

The choice of configuration would be left to the user; however, the initial configuration as delivered will consist of two Western Digital RED 4TB NAS drives configured in a RAID-1 striped configuration. This offers 8TB capacity with priority being given to the speed of access in reading and write modes. The addition of the 10 GBe network card in the PCIe-16 slot will when connected by two cat6/cat7 cables to the computer will give high-speed connectivity making file transfers fast and effective.

5. References

- [1] S. Walton, "Testing Third Generation Ryzen DDR4 Memory Performance and Scaling," 8th August 2019. [Online]. Available: <https://www.techspot.com/review/1891-ryzen-memory-performance-scaling/>.
- [2] B. Thomaas, "AMD 3700X Review," 3rd April 2020. [Online]. Available: <https://www.techradar.com/uk/reviews/amd-ryzen-7-3700x>.
- [3] M. Jennings, "AMD Ryzen 3000 Series," *PC Pro*, pp. 64 -65, 2019.

The total cost of the computer and storage system is £2571.81, including shipping.

4. Conclusion

Both specification lists were contrived to be of good performance and at a reasonable price. They both strike a good balance between functionality and cost with the capability of being upgraded later providing compatible specifications for new hardware is available.

As a former computer retailer, the author recognises that it is too easy to over-specify a computer based on an incorrect perception of the clients need. It is also very easy to specify too low a price point for hardware that leads to compromised performance and lack of flexibility. The equipment chosen is not the highest specification that can be used, and considering the budget available, it is the most cost-effective.

The choice of AMD technology for the CPU's and motherboard is based on third party testing [1] [2] [3] of the new Zen 3 architecture, which shows a clear superiority over Intel in both price and performance in these areas. The use of Intel produced chipsets in networking and memory components is still the best choice for these categories of equipment. The combination of both vendors combining to create a high-performance PC.

Appendix 1 – Granny PC

03/05/2020

Cheap Laptops, Tablet PC, and Cheap LED TVs



NEW IN
Save over 10%

Search for products...

Account
Mark Vaughn... (logout)

5
Basket
Subtotal £443.05

ComputingPeripheralsComponentsNetwork & StorageTV & AudioGadget & GiftsGamingHome & OutdoorsOffice FurnitureBusinessClearance



Items in your Basket

Qty	Description	QuickFind	Stock	Price	Total
1 Update Remove	 Xenta MT Desktop PC, AMD A10-9700 Pro, 8GB DDR4, 240GB SSD, AMD R7, WIFI, No Operating system	948120		£199.89	£199.89
1 Update Remove	 Seagate BarraCuda 2TB Desktop Hard Drive 3.5" 7200RPM 256MB Cache	810559	> 25 in stock	£55.44	£55.44
1 Update Remove	 Wireless Keyboard & Mouse Desktop Set - English/UK Layout	856761	1718 in stock	£18.32	£18.32
1 Update Remove	 AOC E2775SJ 27" LED Full HD Monitor	743356	20 in stock	£147.99	£147.99
1 Update Remove	 Liteon Slim Ext 8x Dvdrw With Link2tv	660938	57 in stock	£21.41	£21.41

Update Basket

Save as wish list

Enter promo code...

Apply

Basket Weight: 16.12Kg

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Reviews of Ebuyer.com

[Continue Shopping](#)

Delivery Options

☐ 3 Working Days **£9.76**
Thu 7th May

☐ Super Saver **£7.27**
Within 5 Working Days

 Shipping restrictions may apply

Basket Subtotal: (inc. VAT) £ 443.05

Shipping Cost: £7.27

Total: £450.32

Appendix 2 – Video Editing PC and Storage

05/05/2020

Cheap Laptops, Tablet PC, and Cheap LED TVs



Search for products...

Account
Register | Sign in

11
Basket
Subtotal £2,561.30

ComputingPeripheralsComponentsNetwork & StorageTV & AudioGadget & GiftsGamingHome & OutdoorsOffice FurnitureBusinessClearance

Items in your Basket

Qty	Description	QuickFind	Stock	Price	Total
1 Update Remove	 AMD Ryzen 7 3700X AM4 CPU/ Processor with Wraith Prism RGB Cooler	883700	91 in stock	£299.97	£299.97
1 Update Remove	 Asus ROG STRIX B450-F GAMING AM4 DDR4 ATX Motherboard	856472	1 in stock	£134.93	£134.93
2 Update Remove	 StarTech 2-Port PCI Express 10GBase-T Ethernet Network Card - with Intel X540 Chip	864785	27 in stock	£270.34	£540.68
1 Update Remove	 Corsair Vengeance LPX 32GB (2x16GB) DDR4 DRAM 2666MHz C16 Memory Kit - White	751874	1 in stock	£139.62	£139.62
1 Update Remove	 Intel 660p Series 1TB, M.2 SSD Single Pack	858211	181 in stock	£127.20	£127.20
1 Update Remove	 Seagate FireCuda Laptop 2TB Hybrid Hard Drive (5SHD) 2.5" 7mm SATA III 6GB/s 5400RPM 128MB Cache	760596	2 in stock	£94.98	£94.98
1 Update Remove	 PNY Quadro P620 Low Profile Graphics Card	831066	1 in stock	£198.48	£198.48
1 Update Remove	 Corsair Obsidian 750d Full Tower Atx Case (black) - Airflow Edition	748767	7 in stock	£141.22	£141.22
1 Update Remove	 Synology DS1618+ 6 Bay Desktop NAS Enclosure	836380	12 in stock	£747.99	£747.99
1 Update Remove	 WD Red 4TB 3.5" SATA NAS Hard Drive	554538	50 in stock	£136.23	£136.23

Update Basket

Save as wish list

Enter promo code...

Apply

Basket Weight: 22.09Kg

Basket Subtotal (inc. VAT)

£ 2561.30

Shipping Cost:

£10.51

Total:

£2571.81

PayPal

Check out

Or

The safer, easier way to pay

Checkout



DiskStation DS1618+

Synology DiskStation DS1618+ is a versatile, compact, yet powerful 6-bay NAS equipped with quad-core processor, designed for small- and medium-sized businesses. It comes with advanced computing applications to meet businesses' demands and supercharges your storage with the optional M.2 SSD adapter card for dual SSD cache drives. DS1618+ is ideal to serve as a centralized file server for simplifying data management and protecting critical assets. Synology DS1618+ is backed with Synology's 3-year limited warranty.

High-performance Scalable Storage Server

Synology DS1618+ is a 6-bay network attached storage solution with great performance and scalability. DS1618+ supports up to 16 drives with two Synology DX517* expansion units, allowing you to start small and easily scale up on demand. In addition to 10GbE add-on card, which can upgrade the network capacity of DS1618+, the PCIe slot also supports the optional SATA M.2 SSD adapter card to function as SSD cache for greatly enhancing storage performance without using the 3.5" drive bays.

DS1618+ is equipped with a quad-core processor and 4GB DDR4 memory (expandable up to 32GB). With Link Aggregation enabled, DS1618+ delivers outstanding sequential throughput performance at over 2,030 MB/s reading and 620 MB/s writing¹.

Btrfs: Next Generation Storage Efficiency

DS1618+ introduces the Btrfs file system, bringing the most advanced storage technologies to meet the management needs of modern businesses:

- Built-in data integrity check detects data and file system corruption with data and meta-data checksums and improves the overall stability.
- Flexible Shared Folder/User Quota System provides comprehensive quota control over all user accounts and shared folders.
- Advanced snapshot technology with customizable backup schedule allows up to 1,024 copies of shared folder backups in a minimum 5-minute interval without occupying huge storage capacity and system resources.
- File or folder level data restoration brings huge conveniences and saves time for users who wish to restore only a specific file or folder.
- File self-healing: Btrfs file system can auto-detect corrupted files with mirrored metadata, and recover broken data using the supported RAID volumes, which include RAID1, 5, 6, and 10.

Highlights

- Powerful and scalable 6-bay NAS optimized for data-intensive work environment
- Quad-core, 2.1 GHz CPU with AES-NI support and 4GB DDR4 memory, expandable up to 32GB
- Outstanding performance at over 2,030 MB/s reading and 620 MB/s writing¹
- Boost IOPS system performance with M.2 SSD cache by using optional M2D17 adapter card²
- PCIe 3.0 slot for optional 10GbE add-on card
- Four built-in 1GbE (RJ-45) ports with failover and Link Aggregation support
- Advanced Btrfs file system offering 65,000 system-wide snapshots and 1,024 snapshots per shared folder

Cross-platform File Sharing

DSM, the operating system running on all Synology NAS, provides fast and secure ways to share your critical digital assets. Synology Drive unifies multiple file portals on Synology NAS and greatly simplifies data management. You can share files to anyone, and customize access permissions for optimal security. Synology Drive makes it easy to share files across multiple platforms — whether it's Windows®, Mac®, and Linux® computers or mobile devices.

Ultimate Backup Solution

DS1618+ integrates various backup applications to safeguard your important data on any device with an intuitive user interface and durable storage technologies.

- **Desktop Backup:** Cloud Station Backup safeguards your PC, Mac, or other desktop devices. DS1618+ is also compatible with Time Machine, allowing you to effortlessly backup your Mac to Synology NAS.
- **NAS Backup:** Hyper Backup comprehensively backs up your data to a local shared folder, an external device, another Synology NAS, an rsync server, a public cloud service, or C2 Backup to ensure data safety.
- **Server Backup:** Active Backup for Server provides an agentless backup solution. It centralizes data from Windows and Linux servers through SMB and rsync to effectively minimize deployment and management costs.
- **SaaS Backup:** Active Backup for Office 365/Google Suite is an on-premise backup solution for public clouds with a centralized dashboard. Optimize storage efficiency with single instancing and block-level deduplication technology.

Effortless Virtualization Environment

Synology's Virtual Machine Manager adds unlimited capabilities to your NAS. Set up and run various virtual machines, including Windows, Linux, and Virtual DSM so that you can test new software versions in a sandbox environment, isolate your customers' machines, and increase the flexibility of your DS1618+ with reduced hardware deployment and maintenance costs.

Synology iSCSI storage fully supports most virtualization solutions to enhance work efficiency with a simple management interface. VMware vSphere™ 6.5 and VAAI integration helps offload storage operations and optimizes computation efficiency. Windows Offloaded Data Transfer (ODX) speeds up data transfer and migration rates, while OpenStack Cinder support turns your Synology NAS into a block-based storage component.

Reliability, Availability & Disaster Recovery

System reliability is of paramount importance to businesses which depend upon their commercial servers every day. DS1618+ responds to these concerns with wide-ranging availability and redundancy features:

- Synology High Availability Manager ensures seamless transitioning between clustered servers with minimal impact to applications, preventing unexpected interruptions and costly downtime.
- Redundant system fans and network ports with failover support ensure maximum continuous service uptime.
- High reliability system design including fan-less CPU heat-sink and passive cooling technology, preventing single points of failure.
- Optional 5-year warranty* is available in select regions.



Next-Generation File System

A modern file system designed to address obstacles often encountered in enterprise storage systems. Safeguarding data integrity through metadata mirroring, self-healing and snapshot replication.



Virtual Machine Manager

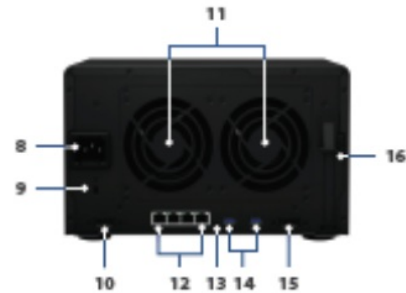
Virtual Machine Manager implements various virtualization solutions, allowing you to manage multiple virtual machines on your DS1618+, including Windows, Linux, and Virtual DSM.

Hardware Overview

Front



Rear



1	Status indicator	2	Alert indicator	3	Power button	4	LAN indicator
5	Drive status indicator	6	Drive tray	7	USB 2.0 port	8	Power port
9	Kensington Security Slot	10	eSATA port	11	Fan	12	1GbE RJ-45 port
13	RESET button	14	USB 2.0 port	15	eSATA port	16	PCIe expansion slot

Technical Specifications

Hardware

CPU	Intel Atom C2535 quad-core 2.1GHz
Hardware encryption engine	Yes (AES-MI)
Memory	4 GB DDR4 Non-ECC SO-DIMM (expandable up to 32 GB with 16 GB ECC SO-DIMM x 2)
Compatible drive type	6 x 3.5" or 2.5" SATA SSD/HDD (drives not included) 2 x M.2 2280/2260/2242 SSD+ (drives not included)
External port	2 x USB 2.0 port 2 x Expansion port
Size (HxWxD)	166 x 283 x 236 mm 166 x 283 x 242 mm (with server ears)
Weight	5.05 kg
LAN	4 x 1GbE (RJ-45)
Wake on LAN/WWAN	Yes
PCIe 3.0 slot	- slot x1 (4-lane) 10GbE network interface cards support - M.2 SSD adapter card support
Scheduled power on/off	Yes
System fan	2 (92 x 92 x 22 mm)
AC input power voltage	100V to 240V AC
Power frequency	50/60-Hz, single phase
Operating temperature	0°C to 40°C (32°F to 104°F)
Storage temperature	-20°C to 60°C (-5°F to 140°F)
Relative humidity	5% to 95% RH
Maximum operating altitude	3,048 m (10,000 ft)

General DSM Specification

Networking protocol	SMB, AFP, NFS, FTP, WebDAV, CIFS (iSCSI), Telnet, SSH, SNMP, VPN (PPTP, OpenVPN™, L2TP)
File system	- Internal: Btrfs, ext4 - External: Btrfs, ext4, ext2, FAT, NTFS, NFSv4, exFAT*
Supported RAID type	Synology Hybrid RAID (SHR), Basic, RAID 0, RAID 1, RAID 10, RAID 5, RAID 6, RAID 10
Storage management	- Maximum single volume size: 108 TB - Maximum of system snapshots: 65,536* - Maximum internal volumes: 512 - Maximum iSCSI targets: 32 - Maximum iSCSI LUNs: 256 - iSCSI LUN clone/snapshot support
SSD cache	- Read-write cache support - ML SSD support
File sharing capability	- Maximum local user accounts: 2,048 - Maximum local groups: 256 - Maximum shared folders: 512 - Maximum concurrent SMB/NFS/AFP/FTP connections: 1,000
Privilege	Windows Access Control List (ACL), application privilege
Directory service	Windows® AD integration: Domain users login via SMB/NFS/AFP/FTP/File Station, LDAP integration
Virtualization	VMware vSphere® 6.5, Microsoft Hyper-V®, Citrix®, OpenStack®
Security	Reverse, encrypted shared folder, SMB encryption, FTP over SSL/TLS, SFTP, rsync over SSH, login auto block, Left's Encrypt support, HTTPS (Customizable cipher suite)
Supported client	Windows 7 and 10, Mac OS X® 10.11 onwards
Supported browser	Chrome®, Firefox®, Internet Explorer® 10 onwards, Safari® 10 onwards, Safari® iOS 10 onwards, Chrome (Android™ 6.0 onwards)
Interface Language	English, Deutsch, Français, Italiano, Español, Dansk, Norsk, Svenska, Nederlands, Русский, Polski, Magyar, Português do Brasil, Português Europeu, Türkçe, Czech, 日本語, 한국어, 繁體中文, 简体中文

Packages and Applications

File Station	Virtual drive, remote folder, Windows ACL editor, compressing/decompressing archived files, bandwidth control for specific user or groups, creating sharing links, transfer logs
FTP Server	Bandwidth control for TCP connections, custom FTP passive port range, anonymous FTP, FTP SSL/TLS and SFTP protocol, boot over the network with TFTP and PXE support, transfer logs
Universal Search	Offer global search into applications and files
Hyper Backup	Support local backup, network backup, and backup data to public clouds
Active Backup for Server	Centralize data backup for Windows and Linux servers with client installation
Backup tools	DSM configuration backup, macOS Time Machine support, Cloud Station Backup Shared folder sync - maximum tasks: 8
Cloud Station Suite	Sync data between multiple platforms by installing the client utilities on Windows, Mac, Linux, Android and iOS devices, while retaining up to 22 historical versions of files Maximum concurrent file transfers: 1,000
Drive	- Maximum Number of Synced Files: 1,000,000 / single file reaction time 427 ms - Maximum Number of Concurrent Connections for PC Clients: 320
Cloud Sync	One or two-way synchronization with public cloud storage providers including Amazon Drive, Amazon S3-compatible storage, Baidu cloud, Box, Dropbox, Google Cloud Storage, Google Drive, hubiC, MegaCloud, Microsoft OneDrive, OpenStack Swift-compatible storage, WebDAV servers, Yandex Cloud
Surveillance Station	Maximum IP cameras: 40 (total of 1,200 FPS at 720p, H.264) (includes two free camera licenses; additional cameras require the purchasing of additional licenses)
Virtual Machine Manager	Deploy and run various virtual machines on Synology NAS, including Windows, Linux, or Virtual DSM
High Availability Manager	Reduce service downtime by setting up two identical NAS into one high-availability cluster
Snapshot Replication	- Maximum shared folder snapshots: 1,024 - Maximum replications: 22
Synology Directory Server	A flexible and cost-effective domain controller solution
VPN Server	Maximum connections: 20, supported VPN protocols: PPTP, OpenVPN™, L2TP/IPSec
MailPlus Server	Secure, reliable, and private mail solution with high-availability, load balancing, security and filtering design (includes 5 free email account licenses; additional accounts require the purchasing of additional licenses)

MailPlus	Intuitive webmail interface for MailPlus Server, customizable mail labels, filters, and user interface
Collaboration tools	- Chat maximum users: 1,500 - Office maximum users: 1,000 - Calendar: support CalDAV and access via mobile devices
Note Station	Rich-text note organization and versioning, encryption, sharing, media embedding and attachments
Storage Analyzer	Volume and quota usage, total size of files, volume usage and trends based on past usage, size of shared folders, largest/modifies frequently modified files
AntiVirus QuotaGuard	Full system scan, scheduled scan, white list customization, virus definition auto update
Download Station	Supported download protocols: BT, HTTP, FTP, NFS, eMule, Thunder, FlashGet, QQDL Maximum concurrent download tasks: 80
Web Station	Virtual host (up to 20 websites), PHP/MySQL/Perl, 3rd-party applications support
Other packages	Video Station, Photo Station, Audio Station, DNS Server, RADIUS Server, iStor® Server, Log Center, additional 3rd party packages are available in Package Center

Environment and Packaging

Environment safety	RoHS compliant
Package content	- DS1618+ main unit x 1 - Quick Installation Guide x 1 - Accessory pack x 1 - AC power cord x 2 - RJ-45 LAN cable x 2
Optional accessories	- 4GB DDR4-2133 Non-ECC SO-DIMM (DHN2133-4G) - 16GB DDR4-2133 ECC SO-DIMM (RAM2133DDR4SO-16G) - Synology E16G17-E2 / E16G15-F1 10GbE Ethernet adapter - Synology M2017 M.2 SSD adapter card - Expansion Unit DS17E - VirtualStation V5368-40, V5968-40 - Surveillance Camera License Pack - MailPlus License Pack - Virtual DSM License Pack
Warranty	3 years*

*Model specifications are subject to change without notice. Please refer to www.synology.com for the latest information.

1. Performance figures may vary depending on environment, usage, and configuration.
2. DS1618+ supports dual M.2 SSD through M2017 adapter card, sold separately.
3. DS1618+ supports up to two Synology DR17, sold separately.
4. 3-year warranty is available as an optional bundle with DS1618+, 3-year Extended Warranty service add-on. Visit https://www.synology.com/en-global/products/Extended_Warranty for more information on availability.
5. eSATA Access is purchased separately in Package Center.
6. System snapshot includes snapshots taken by BCS Manager, Snapshot Replication, and Virtual Machine Manager. Availability of these packages varies by model.
7. The warranty period starts from the purchase date as stated on your purchase receipt. Visit <https://www.synology.com/company/legal/warranty> for more information.

SYNOLOGY INC.

Synology is dedicated to taking full advantage of the latest technologies to bring businesses and home users reliable and affordable ways to centralize data storage, simplify data backup, share and sync files across different platforms, and access data on-the-go. Synology aims to deliver products with forward-thinking features and the best in class customer services.

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DS1618+ 2019-0603-REV004

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Original Can be downloaded from:

https://global.download.synology.com/download/Document/Hardware/DataSheet/DiskStation/18-year/DS1618+/enu/Synology_DS1618_Plus_Data_Sheet_enu.pdf

1909160 Computer Arch. Assignment Report

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

Instructor

56/100

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GRADING FORM: GJ_2019

**MARK
VAUGHAN**

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ENGAGEMENT WITH LITERATURE



While the information within the assignment is good, 'engagement with literature' means you have to show you've read up on the various sections, and can back up your assertions/choices with evidence. Just as one example, there are numerous sources out there who test and recommend hardware configurations for video editing. These should have been read and cited. Just three sources is insufficient. This is by far the weakest section here.

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KNOWLEDGE AND UNDERSTANDING



Competent demonstration of knowledge of the general underlying concepts and technologies used. bits and Bytes mixed up at times.

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COGNITIVE AND INTELLECTUAL



Despite the outcomes being mostly sensible, Could have done more in looking at the alternative solutions, and providing solid justification as to why your chosen components are the most suitable compared to others. Citing more researched material would have helped here.

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PRACTICAL APPLICATION



Generally appropriate systems specified. However from the brief: "You should also produce a 'shopping

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list' of actual components (as if you were going to build the computer yourself from scratch)... DO NOT simply find a ready built PC .." Which is close to what the 'granny PC' is! Isn't P630 built in intel graphics? If its a P620 Quadro - possibly a bit underspecced - RAM for example under the recommended amount for serious video effect processing. 4*2TB RAID1 for the NAS not particularly sensible as the start configuration either. NAS should not have been included in the main Video PC budget - more money then available for better graphics etc.

TRANSFERABLE SKILLS



Good writing style. Reads well with a good 'flow'. Don't use the 2 column layout unless your lecturer specifically asked for it. Stick to the one the major project will use as explained in the AES module. Would have benefited in having more images of some of the components included in the main body to give context and interest.

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