



Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

Examination Answer Books

12 Pages

Instructions to Candidates

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3. The answers must be legibly written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
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Complete, fold and seal
(see note 2 below)

SURNAME: SEARLE

FORENAME(S): GEORGE PAUL

1	Student Number	P148812
2	Title of Examination Paper	NETWORK & DATA CENTRE MANAGEMENT
3	Module Code	ACCAG001
4	Date and Time of Examination	17/01/19 09:00
5	Examination Venue	DYLAN THOMAS CENTRE
6	Seat Number	G002
7	Number of Answer Books handed in	1

List the numbers of the questions you have attempted	Office Use
1	20
3	19
4	24 1/2
Total	63 1/2

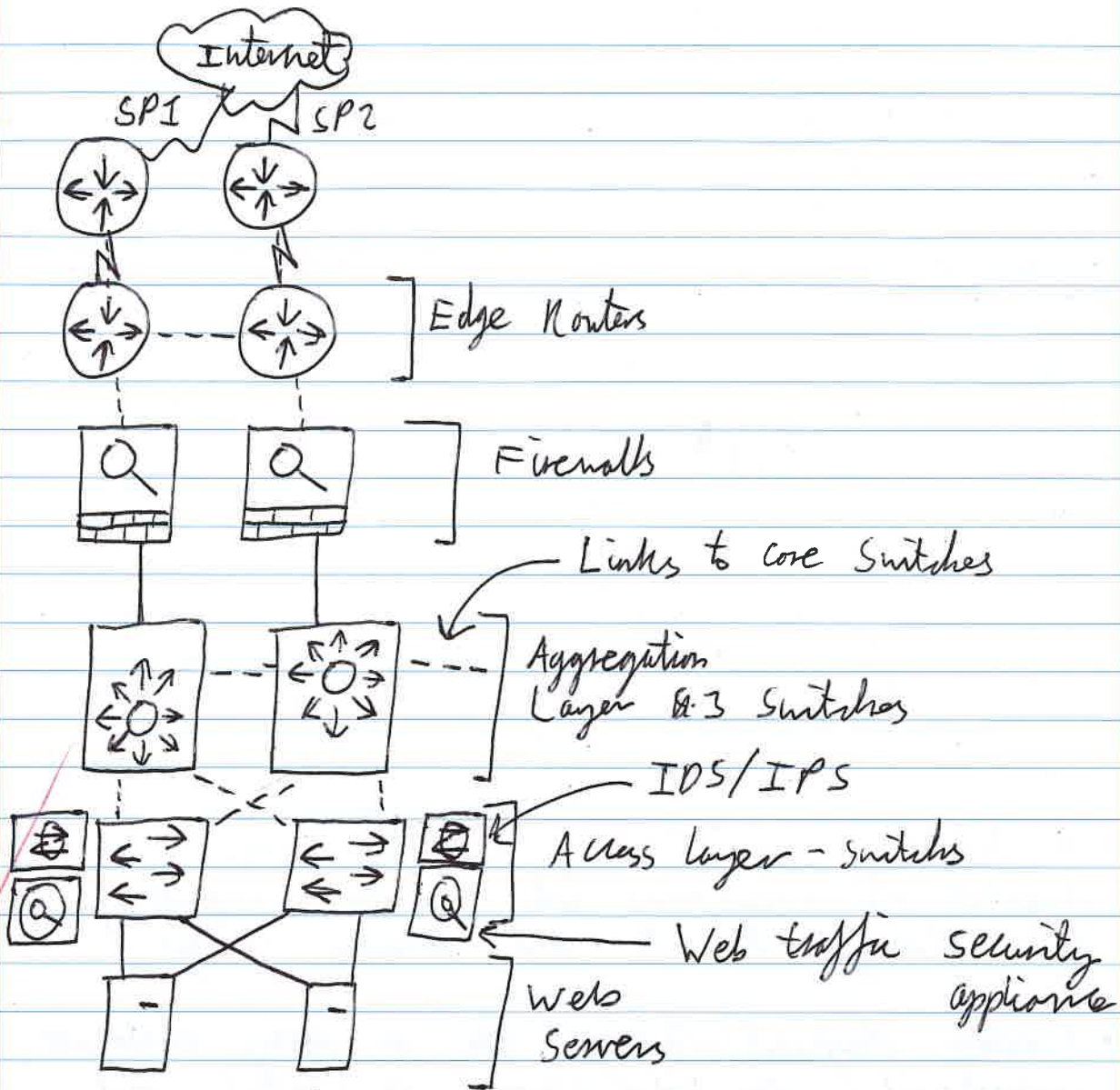
20
19
24 1/2

85 1/2

63 1/2

1)

a)



- The Internet Server farm (ISF) hosts large web based applications. This includes E-commerce and business-to-business customer services.
- Most users will access the (ISF) Internet SF from outside the network (from the Internet). Internal users can also access the Internet SF.
- Internet SF must be highly scalable and secure, due to the volume of traffic from external untrusted users on the Internet.
- Also called an Internet Data Centre



1)

- b) • A SAN is a network with the main purpose of transferring data between computers and storage elements and among storage elements.
- Provides physical storage via an array enclosure, connectivity via Fibre Channel or iSCSI and a management layer.
 - Provides high availability, flexibility, high performance.
 - Simplifies storage management
 - Allows for business continuance
 - Supports the ~~info~~ information - life cycle model.
 - Allow any-to-any connectivity via an interconnect.
 - Often uses block-level storage

(20)

20

- 3)
- a) Weaknesses of IPv4
- Address space depletion
 - Lack of true end-to-end model due to NAT
 - Increasing routing table size

IPv6

- 128-bit address space allowing for greater global reachability / ~~for~~ much larger address space.
- True end-to-end model, NAT no longer needed.
- Better security and mobility
 - ↳ IPsec mandatory
 - ↳ Mobile IP RFC-compliant
- Address autoconfiguration
- Plug-and-play
- ~~No~~ Simpler header that is more efficient and hardware optimised.
- Better multihome support
- ICMP ~~is used~~ plays an important and key role in IPv6.

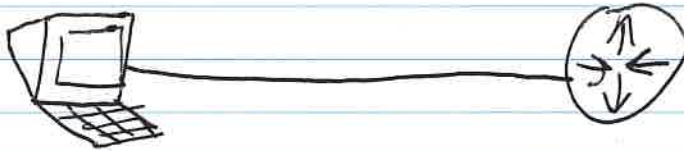


3)

a) New features in IPv6

- Link-local addresses
- Multiple addresses per interface
- Prefix renumbering
- Autoconfiguration
- Prefix aggregation
- Extension headers that allow for more efficient handling of IP options

b)



Router Solicitation

Router ~~advertisement~~
advertisement

Duplicate address detection

- Stateless address autoconfiguration is used by IPv6 enabled hosts to automatically create an IPv6 address.
- Firstly the host sends a RS message to FF02::2 the all routers multicast address.
- The router will immediately respond with a RA that contains the IPv6 prefix.



~~link~~ gateway default gateway link-local address and other information (e.g. DNS address).

- The host then creates an address using the EUI-64 process ^{or random} and the IPv6 prefix.
- Lastly the host sends a Neighbour Solicitation to the all nodes multicast address for DAD. If a device replies the IPv6 address is already in-use and user intervention is needed ~~to~~ (e.g. to statically configure an address).

8

19

19

4)

- a)
- Flat network (non-hierarchical)
 - No redundancy
 - Single point of failure (central switch)
 - Not Scalable
 - Poorly documented
 - Unreputable vendor (e.g. 3com)
 - Unclear addressing scheme
 - No firewall on the proxy link
 - Servers not clearly identified
 - Single edge router
 - ~~No~~ ~~se~~
 - Poor security (no security appliances or IPS/IPS)

6

4)

b)

i)

Network Manager

- Maintenance and support of the network infrastructure.
- Training staff
- Communicating with business management team
- Back-ups
- Disaster ~~recovery~~ recovery planning
- Addressing staff queries

✓

ii)

Network Administrator

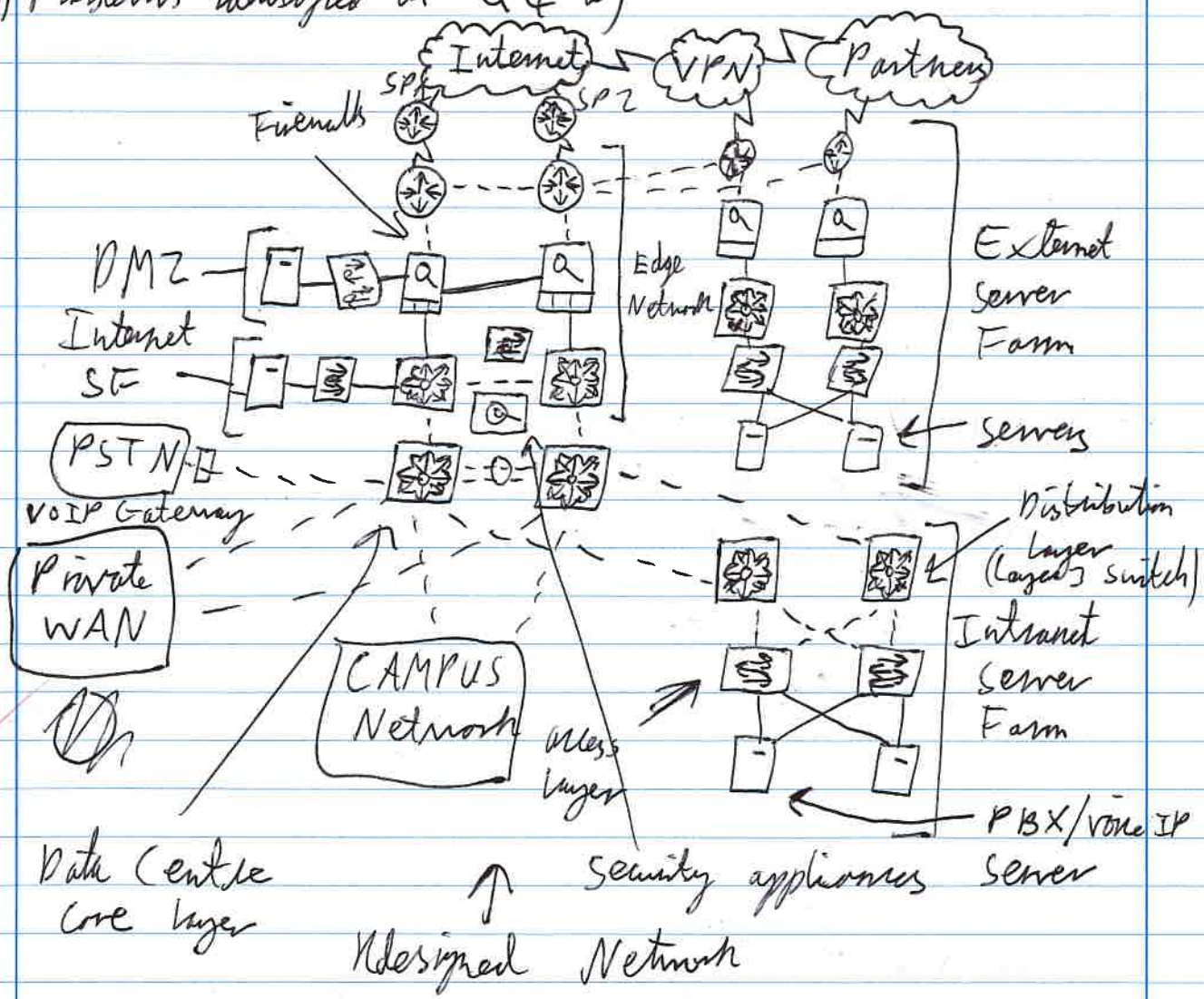
- Full and complete responsibility for all aspects of the network. Implementation, management and upgrades and support.
- Monitoring network health and performance
- Network application support and implementation
- ~~End user~~ provide support for end users.

✓

- Reset user accounts and passwords
- Upgrade budgeting

c)

i) Problems identified in Q4 a)



- The network has been redesigned using the Cisco Hierarchical design model using Core, Distribution and access layers. This allows for Scale Scalability, high availability,



- high performance and flexibility
- There is no longer a single point of failure
- Improved security
- Highly redundant
- Improved network edge design with DMZ, Internet Server Farm and Security appliances.
- Allows for future scale scalability and network growth
- Feature Internet, Intranet and Extranet SFs.
- Fault containment

- ii) The network redesign features a VoIP gateway to access the PSTN.
- IP PBX server to support VoIP services
 - QoS consideration

iii) Assumptions:

- There are VoIP phones in the network
- Campus network has distribution layer and access layer with end users.
- Continuous address scheme used
- ~~not~~ includes wireless APs

- uses VLANs
- More redundancy than shown in diagram
- Network summarisation
- Budget is sufficient for redesign
- Dell ~~equips~~ network devices ~~are~~ to keep the budget down and ease the support of management.
- Firewall rules
- There is a SAN is the ~~Inter~~ Intranet server Farm.
- Fibre links between Core and distribution.
- ^{Multi-mode} Poling and ACL implementation

15

~~24 1/2~~

24 1/2



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(see note 2 below)

SURNAME: Lawrence

FORENAME(S): Paul, Michael

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7	Number of Answer Books handed in	<u>1</u>
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List the numbers of the questions you have attempted	Office Use
1	20
3	22
4	22
Total	64

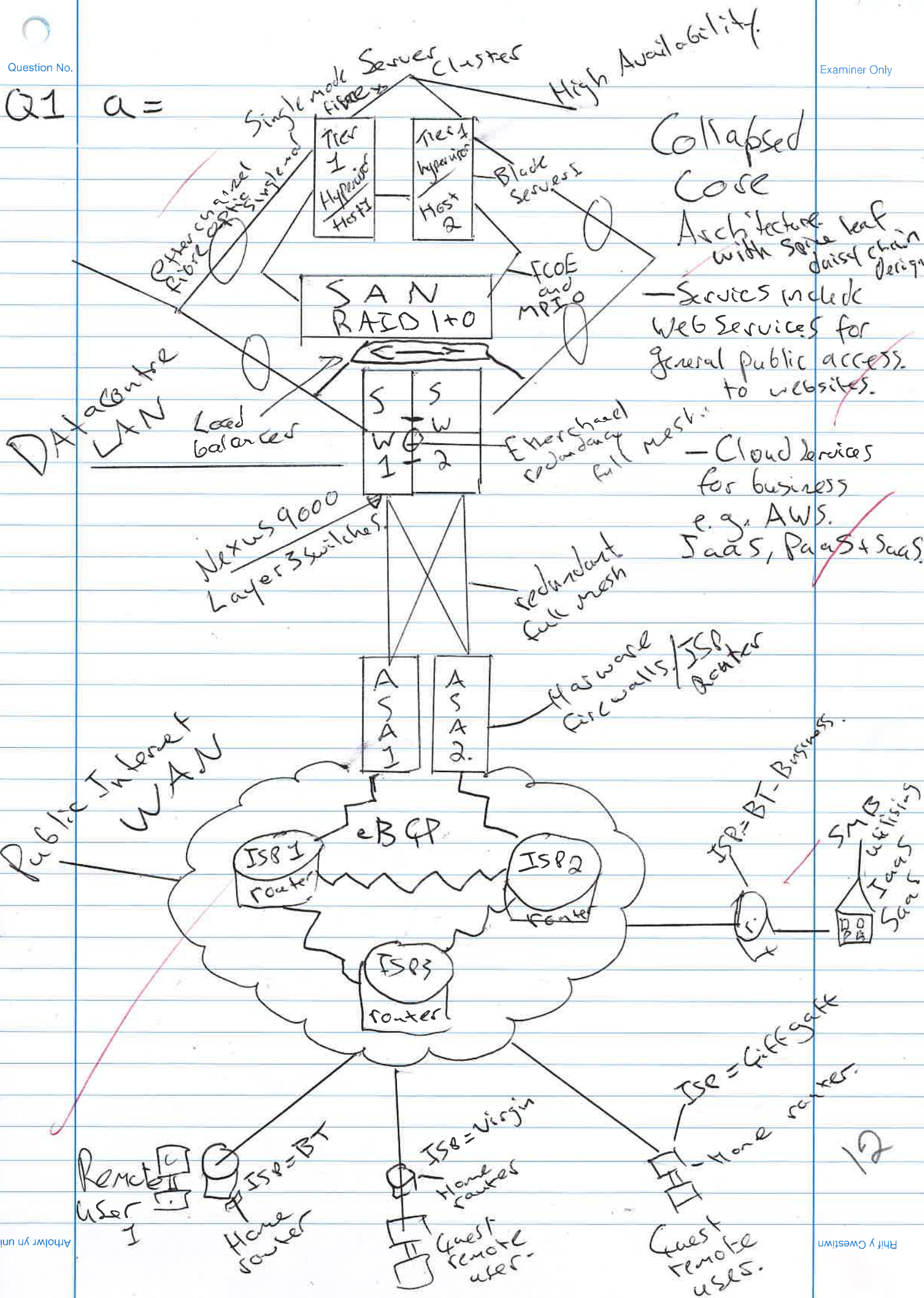
20
22
22

64

(Gweler yr ochr arall am y fersiwn Cymraeg)

85%

Q1 a =



Q1 b = A SAN is a Segment of a datacentre that stores all of its data. It is connected directly to the host blade servers. It contains many Hard Disk Drives or Solid State drives that are logically connected using Redundant Array of Independent Disks (RAID). Within a datacentre RAID 1 or RAID 10 as it is called provides Mirroring (live data backup) and Striping (load balancing) of captured disk speeds with a volume.

A SAN is utilised by end users to access and save data stored within their VM's are also stored here within a virtualised environment.

(Fibre Channel over Ethernet) A SAN Disk array can be further partitioned to provide data domains for security and efficiency and ease of management.

(SCSI) A SAN Segment needs ultra fast switching speeds because it where the most amount of traffic occurs within a centralised datacentre.

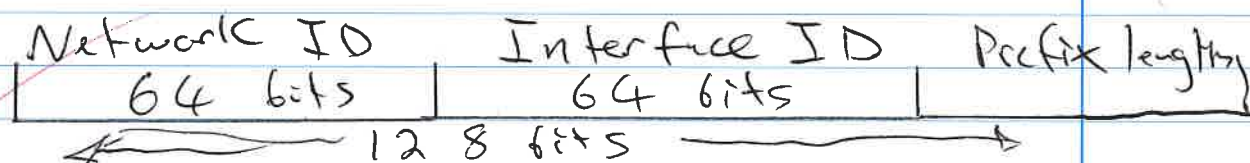
20

20

Q3 IPv6 is a Successor^{to} Internet Protocol (IP) to IPv4. It was developed by the IETF, to provide a large amount of public IP addresses due to the advent of the IoT. IPv6 also addresses security and performance at Layer 3 & 4 within a network environment. IoT devices are estimated to be over 18 billion as of 2017.

IPv4 address range which is a 32 bit^{-dotted decimal} address only allows for 2^{32} addresses which is 4.2 billion. So public addresses ran out, to combat this issue Network address Translation (NAT)^{and VLSM} was created to translate ~~public to private~~ private to public IP addresses this cause ~~is~~ Source - Destination issues for connectivity to devices behind a NAT router, so IPv6 was invented to solve these issues.

IPv6 is a 128 bit address that consists of two parts: A 64 bit network ~~prefix~~ ^{prefix} and a 64 bit Interface ID. It does not use a subnet mask ~~rather~~ like IPv4 but a prefix length e.g.



because it's a 128 bit address it theoretically has 2^{128} available addresses, which is 340 undecillion, which is a number larger than all of the atoms in the universe. A /64 bit prefix length is usually used which identifies the Interface ID which is usually made up of a NIC MAC address of an end device. Each /64 prefix contains 2^{64} addresses which is 18.4 quintillion^{addresses per} subnet. So this address scheme solved the shortage of IP addresses.

using a technique called EUI-64

Where IPv4 uses dot-decimal base¹⁰ for addressing ^{made} up of 4 octets of 1 byte each (8 bits).

Q3a IPv6 uses a base 16 numbering system to allow for a ~~larger~~ ~~numbering~~ more addresses. It utilizes Hexadecimal which has a range from 0-9 and A-F = 16. An IPv6 address is further segmented into 'positions' rather than octets as IPv4 uses. There are 8 positions broken up with a : each containing 16 bits, ~~each~~ or four characters ~~and~~ numbers each containing 4 bits each or a nibble (half a byte) e.g. figure 1

2001:ADAD:DEAA:FACE:0000:20CA:39FF:D678/64

↑ ↑ ↑ ↑ P
 global ID regional ID or ISP Business ID Subnet ID Interface end device unique ID

IPv6 does not contain broadcast messages because of the issues they have

The IPv6 header has IPsec ^{suite of protocols} mandatory integration for higher security using encryption standard such as Advanced Encryption Standard (AES-256).

IPv6 has 3 address categories.

1. ~~Unicast~~ Unicast: one-to-one communication which contains:

- ~~Global~~ Unique Global address, equivalent to IPv4 public address that starts with 2001 or higher
- ~~unique~~ local address which is equivalent to private address in IPv4 that starts with FE80
- Link local - layer 2 address equivalent to APIPA address in IPv4.

15

Q3a There are two other addresses:

Multicast which is a One-to-many in a group used by dynamic routing protocols.

Anycast which is a one-to-nearest used in IPv6 for load balancing.

Because there is no broadcast addresses in IPv6 there is no ARP which is used in IPv4 which is insecure protocol.

IPv6 utilize Internet Control Message Protocol v6 ICMPv6 to provide many additional features, one main feature is Neighbor Discovery Protocol (NDP).

NDP is made up of 4 main messages which are: Router Solicitation (RS), Router Advertisement (RA), Neighbor Solicitation (NS) and Neighbor Advertisement (NA). ICMPv6 also utilizes 'ping' and trace route similar to IPv4.

Q3b Stateless Auto Address Configuration (SLAAC) is utilised within IPv6 for devices to autonomously negotiate and configure their own IPv6 addresses without the need for a DHCP Server. It functions by a router sending (RA) messages to the Access layer of a LAN to end devices, which then acknowledge this with a RS message. The router will then provide the IPv6 Network prefix and interface ID using EUI-64 and send that along with the prefix length and default gateway address to the end device.

~~RA~~ NA messages are then used by the end client to check the address is unique, this process is called Duplicate address detection, the neighbour then responds to confirm or deny DAD has taken place.

22

22

Q4 a 1 = No network Segmentation, or ~~Configurable~~ IP address scheme. and no wireless AP's.

2 = Using hubs which are not used anymore because they ~~create~~ ~~create~~ are one Collision domain and amplify broadcast messages that can cause a broadcast storm and a (DoS)

3 = Using ADSL Modem which is very slow telephone line etc that aren't used anymore.

4 = This is no higher Archical network Architecture, No Core, distribution or access layers. flat backbone design. with no ~~redundant~~ redundant links.

5 = Using multivendor equipment that utilise legacy technology and unreliable providers such as 3com, that wouldn't function in today's WAN/LAN Networks.

6 = No Switches have been used to create Collision domain for each port and NO VLANs for network management and to create broadcast domain.

7 = Very bad topology documentation, that also does not show physical security. i.e. RFID Server room. and the ~~server~~ server.

8 = Servers aren't centralised. No VOIP or PAX servers.

Q4 b i = A network manager is responsible for the wellbeing and design of the network along with the budget and all the network staff who work for him or her.

ii = A network Administrator is responsible for the day to day monitoring and maintenance of the network devices i.e. Servers, routers, switches.

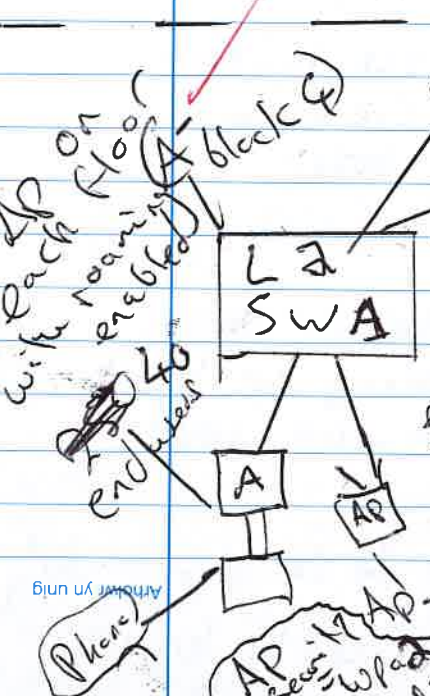
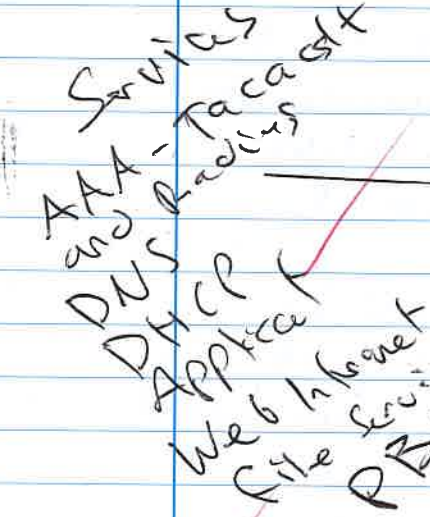
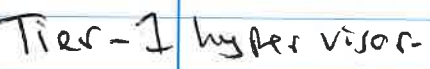
6

Question No.

Examiner Only

VLANs

- = 11 = A
- = 12 = B
- = 13 = C
- = 14 = D
- = 15 = E
- = 16 = F
- = 17 = G



48 port L2 Switches
are used with gigabit ports

22

22



**Complete, fold and seal
(see note 2 below)**

SURNAME: OY ZAHRA

FORENAME(S): NABII

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1	Student Number	P147535
2	Title of Examination Paper	Data Centre Management
3	Module Code	ACCA 6001
4	Date and Time of Examination	17/01/2019
5	Examination Venue	Dylan Thomas Centre
6	Seat Number	G007
7	Number of Answer Books handed in	3 (Q1-Q2-Q4)

List the numbers of the questions you have attempted	Office Use
Q1	16
Q2	15
Q4	24
Total	56

(Gweler yr ochr arall am y fersiwn Cymraeg)

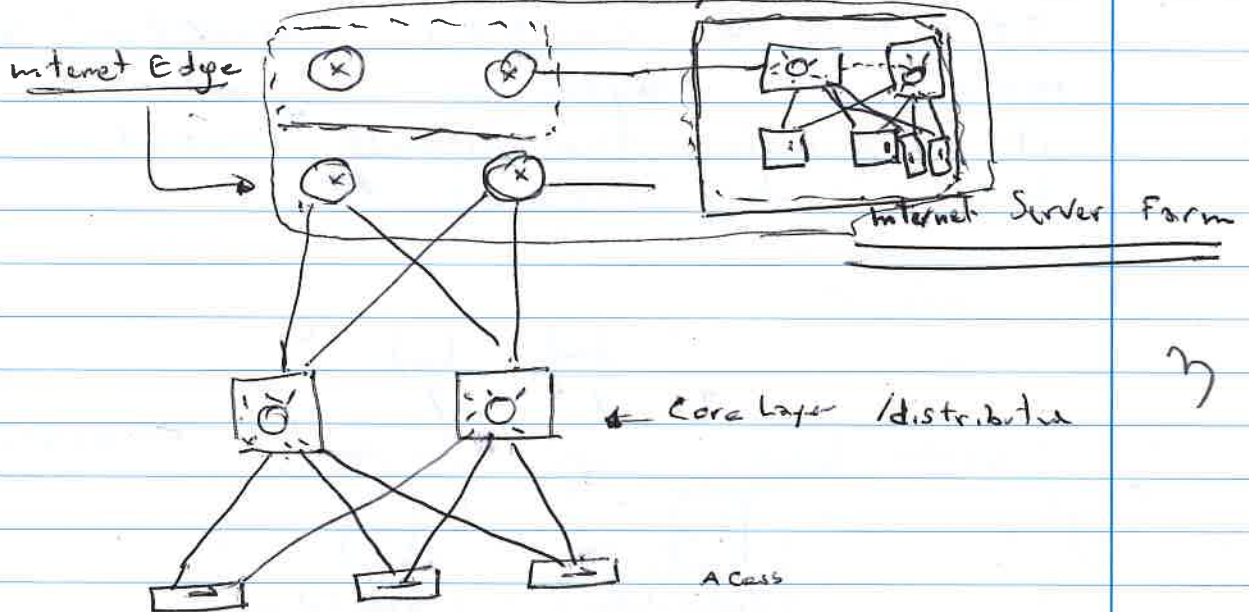
$$\begin{array}{r} 16 \frac{1}{2} \\ 15 \frac{1}{2} \\ \hline 24 \end{array}$$

56

75%

Q1-A - Internet Server Farm

- Internet Server Farm is group of server located somewhere in the internet to support core business of the company.
- it rely on web browsers and web applications.
- The main goal is to provide support to e-business / applications.
- it can be accessible by anyone through internet.
- Available for the internet community.
- Security and Availability are the main concerns of this type of server farms because anyone can access them.
- Located outside the corporate network.

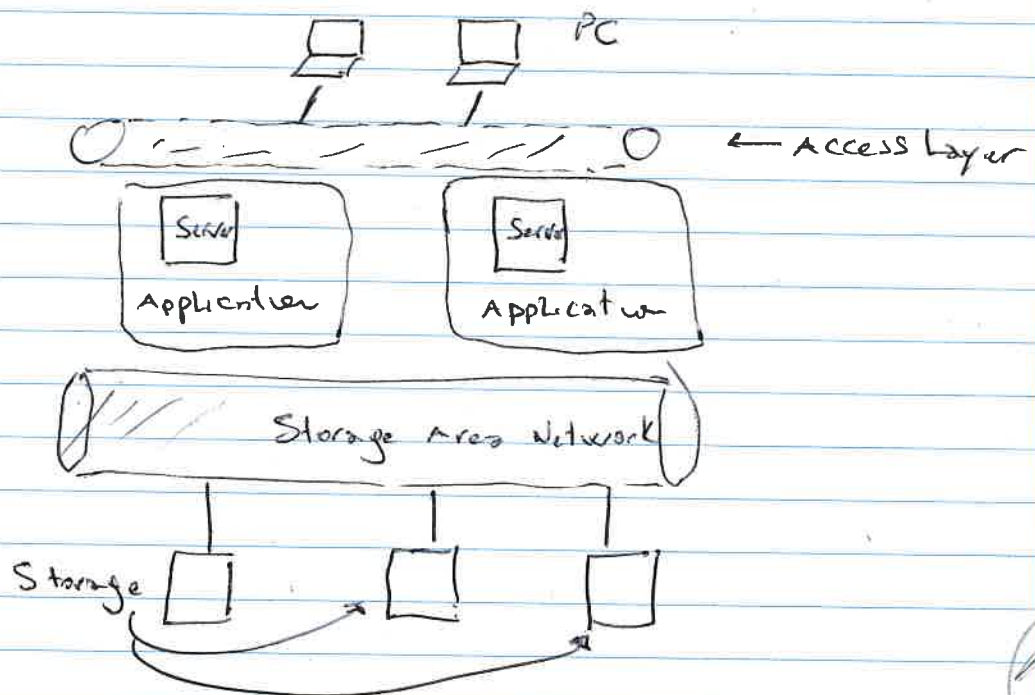


- Data centres that support this type of server farm called Internet Data Centre (IDC)

Q1 B

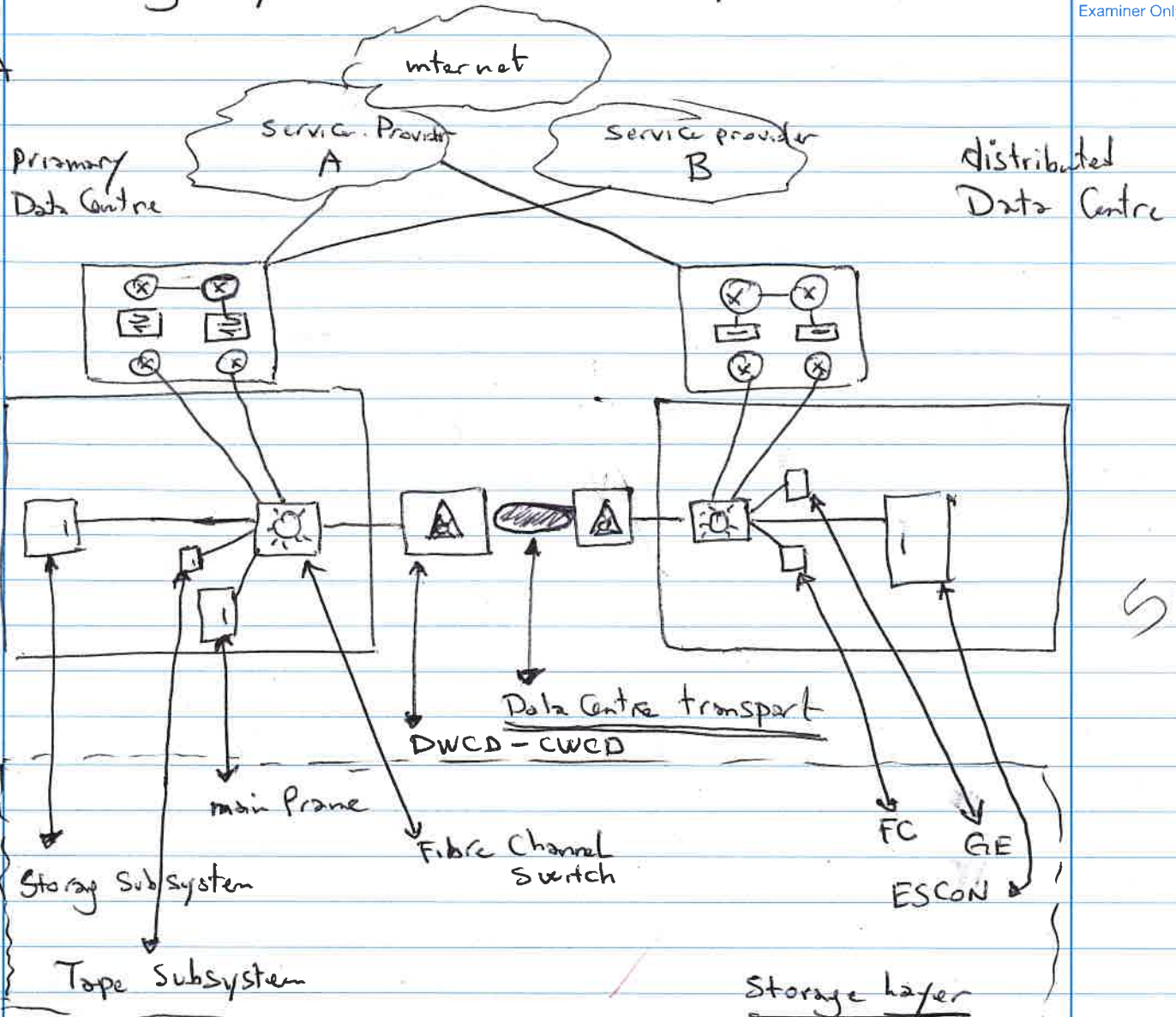
Storage Area Network

- Storage Area Network Association (SNIA) define the Storage Area Network meaning as Network that Have Primary Purpose of Providing High Speed Connection between Computer Systems and Storages. ✓
- it Allow Any to Any Connection Across the Network. ✓✓
- Specialize in High Speed Connection ✓
- it provide Physical Connection and management Layer. ✓
- it eliminate the typical ^{dedicated} Connection between Servers and Storages. ✓



Storage Layer and transport Layer

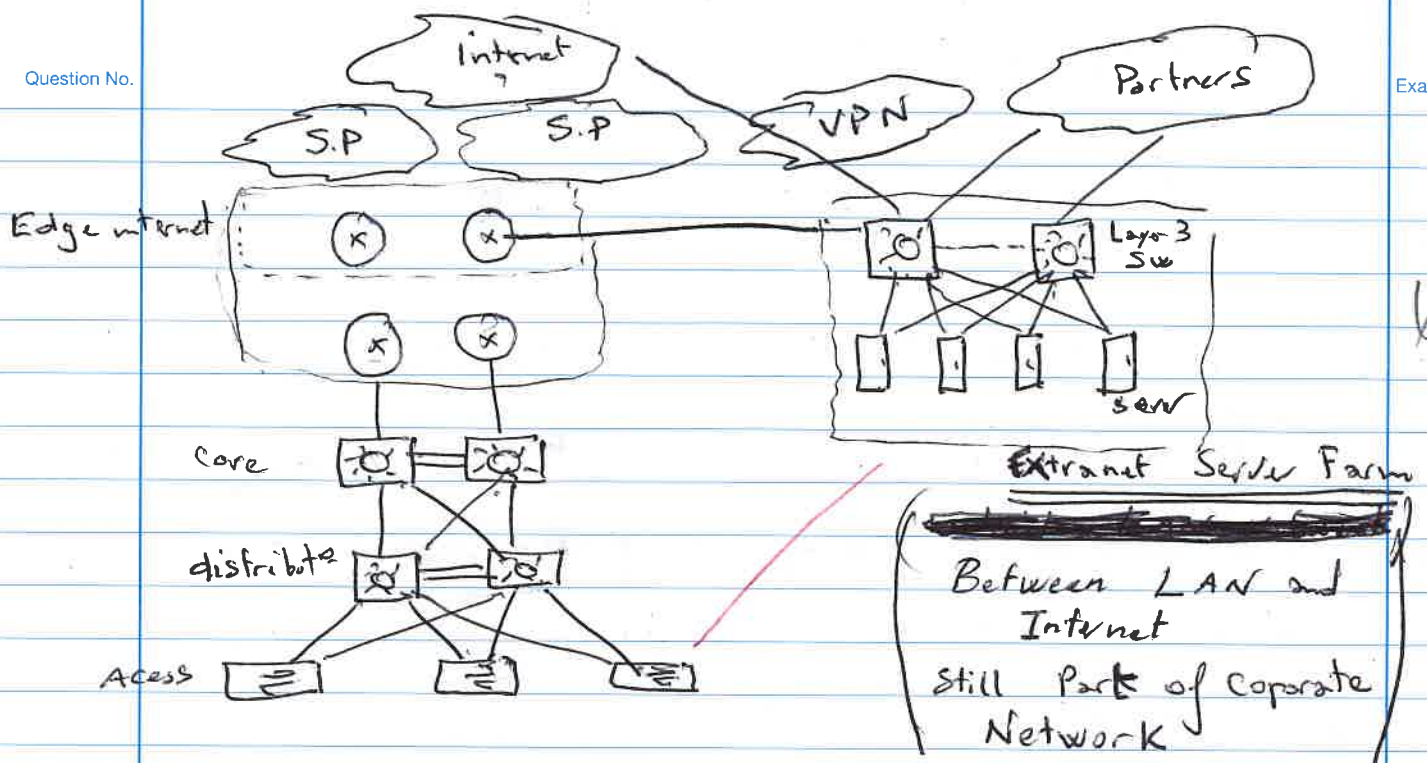
Q2 A



transport layer Help to connect All resources within the storage layer.
All resources can be seen and shared by different locations.

Q2-B The functionality of Clustering

- Clustering is group of servers connected through software and hardware and act as single server.
- Clustering allow using multiple servers to run a single application all within a single virtual server machine.
- The end user always think that he is accessing single server when using this applications.
- main characteristics: Load balancing traffic, Parallel Processing & Scalability (use to scale farms), Support High Availability and Sharing of resources.



- Only Partners and Local Corporate Users have Access to it.
- to support business to business.
- it can be Accessed Using VPN through internet.

15/2

15/2

Q4

A - List of Problem identified:

- * Single Point of Failure by Connecting ALL Floors and blocks to Single Hub
- * Mixture of using Fibre Optics and UTP Cable
- * Using different Brands of Network devices, Some Have Less Market Support.
- * Using many Lease Lines to Access the internet (waste of resources)
- * No Firewall before The Internet Egress
- * IP Addressing Scheme is confusing ~~to~~, Subnetting Not being used Properly (No VLSM)
- * No VLANs
- * No Information About Servers Location

B- Job function and Responsibilities of Network manager

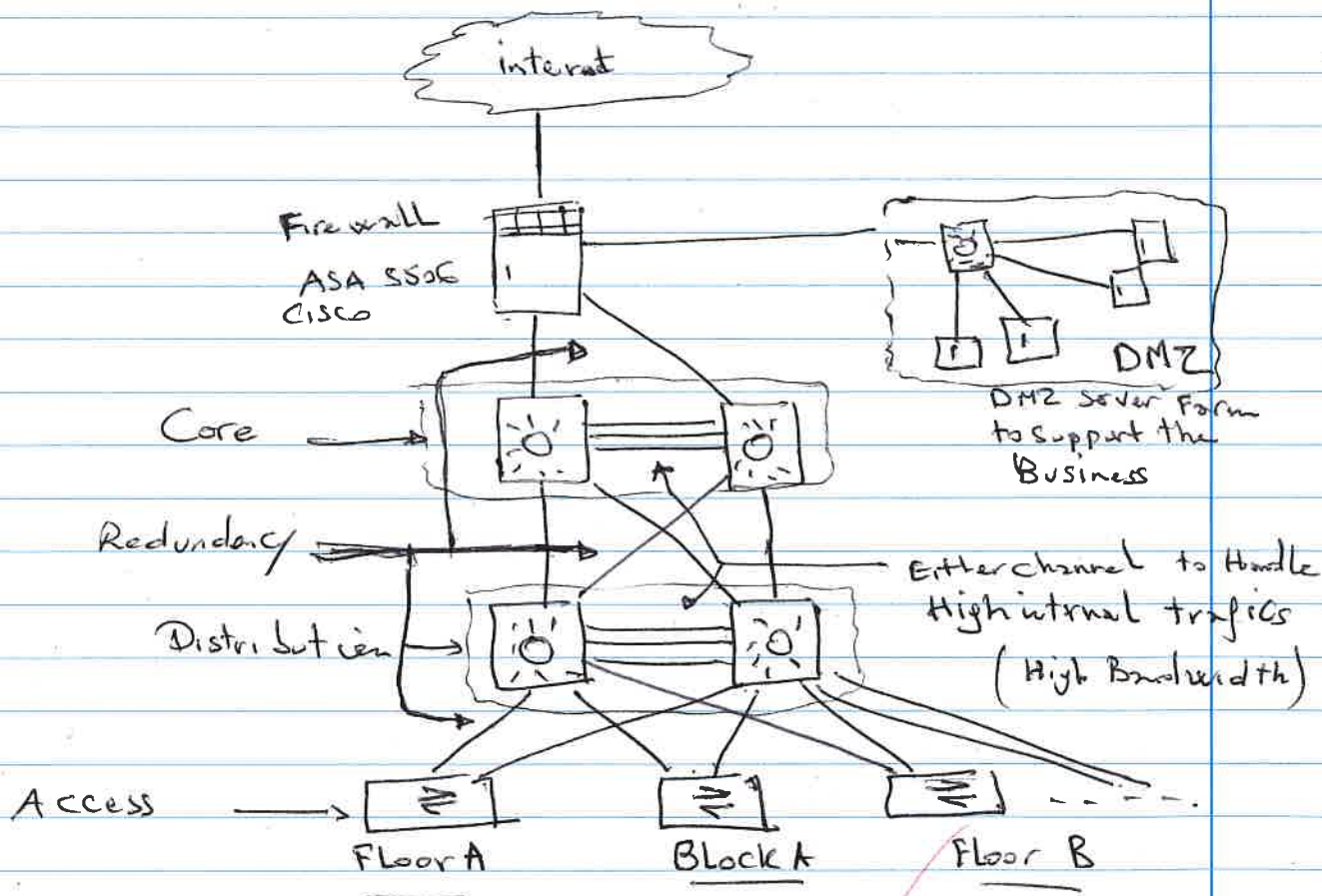
- to manage the entire Network department.
- to Liaise with All other Department in the Company.
- to Support Network Admins and Network Planning.
- to design Disaster Recovery PLAN.
- to ensure That the Network is test often.
- to ensure that Policies are implemented.
- to interview and recruit Staff.
- to ensure that the Staff are trained Properly So that the Network is Secure.

Q4-B

Network Administrator Job and Responsibility:

- to ensure that The network is operating Properly.
- to ~~analyse~~ analyse the Network Performance.
- to ensure that Policies are implemented.
- to update and install Network Devices.
- to ensure that the Network is Secure.
- to Control Access to ALL Users in the Company.
- to report Back to the Network manager.

Q4-C



Ci

All problem and weaknesses identified and the measures taken to overcome this issues :

- * Using Single Brand Cisco to ease the management of All the Network Devices, Also it has great reputation on the Networking Markets.
- * Using the Fire wall (ASA 5506 Cisco) to Stop Unwanted traffic From the internet, this will Boost the Network Security.
- * Using Hierarchical design will Help The Network Performance through the use of the 3 Layers Core distribution Access, Redundancy is implemented using Multiple Paths from Layer to Layer and out to the internet.
- * Using VLSM and Applying Proper Subnet to differentiate each Floor and each Department.
- * Using VLANs for each department will improve the Network traffic throughout the Network.
- * Using Fibre optics in the entire Network (except Access Layer) will have major impact on the Network Performance (as long as there is budget for this).
- * Using Only 2 Lease Lines for the internet Access to guarantee redundancy.

- ii
- * Creating Separate Voice VLAN to Handle All Voice traffic in the Network
 - * High Priority should be given for this VLAN so that Communication (Voice) are High Quality
 - * Using Cisco IP Phones will Help getting Better Quality of Voice Service
 - * we will go with SNMPv3 because it can provide Both Encryption and ~~Authentication~~ Authentication

iii Assumptions:

- * Having Enough resources.
- * Having trained Engineers to build The Network.
- * Having Enough time to achieve this changes.
- * Having Correct (good) budget to Spend.
- * Having the management Approval for this task
- * All outside Organisation Collaborate with us and Support our mission (ISP - vendors etc.)



12 Pages

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SURNAME: Ren

FORENAME(S): L:

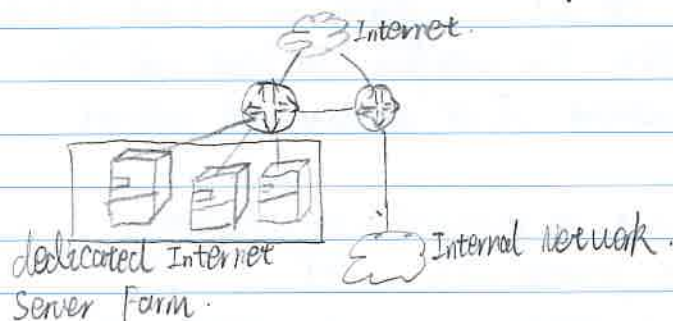
1	Student Number	1805212
2	Title of Examination Paper	Network & Data Centre Management
3	Module Code	ACCA 6001
4	Date and Time of Examination	17/11/2019 9am 2 hours
5	Examination Venue	Vivian Hall
6	Seat Number	G005
7	Number of Answer Books handed in	1

List the numbers of the questions you have attempted	Office Use
Q1	11
Q3	17
Q4	17
Total	45

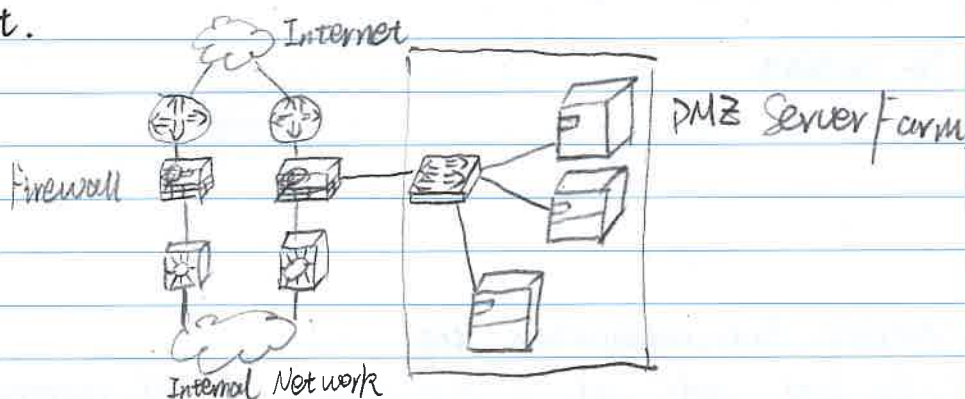
(Gweler yr ochr arall am y fersiwn Cymraeg)

Q1. There are two types of Internet Server Farm: dedicated Internet Server Farm and DMZ Internet Server Farm.

As for dedicated Internet Server Farm, its main purpose is to undertake the functionality that needs accessing external Internet and external users can also access it using Internet. So it is often placed at the edge of internal and external network. And it runs the Internet application of the enterprise.



As for DMZ Server Farm, it is often placed in the DMZ zone and there are firewalls to control the external access to it and improve its security. The applications running on DMZ Server Farm also face the Internet but the external access to them will be limited in part.



b. SAN is a specified, high-speed network to transmit data between servers and storage devices.

Q3

Weaknesses of IPv4:

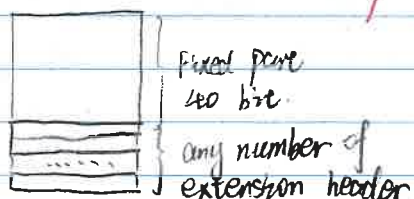
- a.
- ① expansion of routing table, which makes the routing devices need more computing power, memory.
 - ② Lack of true private-to-private model. It uses NAT to solve the problem of address consumption.

Features of IPv6:

- ① Longer address which is 128 bit compared to 32 bit of IPv4 address.
- ② Multiple addresses one interface. One interface can have one local link address and one or more ~~multicast~~ unicast addresses and multicast address.
- ③ No broadcast address.
- ④ Simplified header and can be processed more efficiently.
- ⑤ Elimination of public-to-private NAT model.
- ⑥ There are three types of address, which are unicast (one to one), multicast (one to many), anycast (one to nearest).
- ⑦ In IPv4, the next layer protocol is specified in "Protocol" field in header. In IPv6, the "next header" field serves the same function. And IPv6 header has extension headers which provide more flexibility and efficiency to process it.

To construct

IPv6 header.



b. Stateless Autoconfiguration Steps:

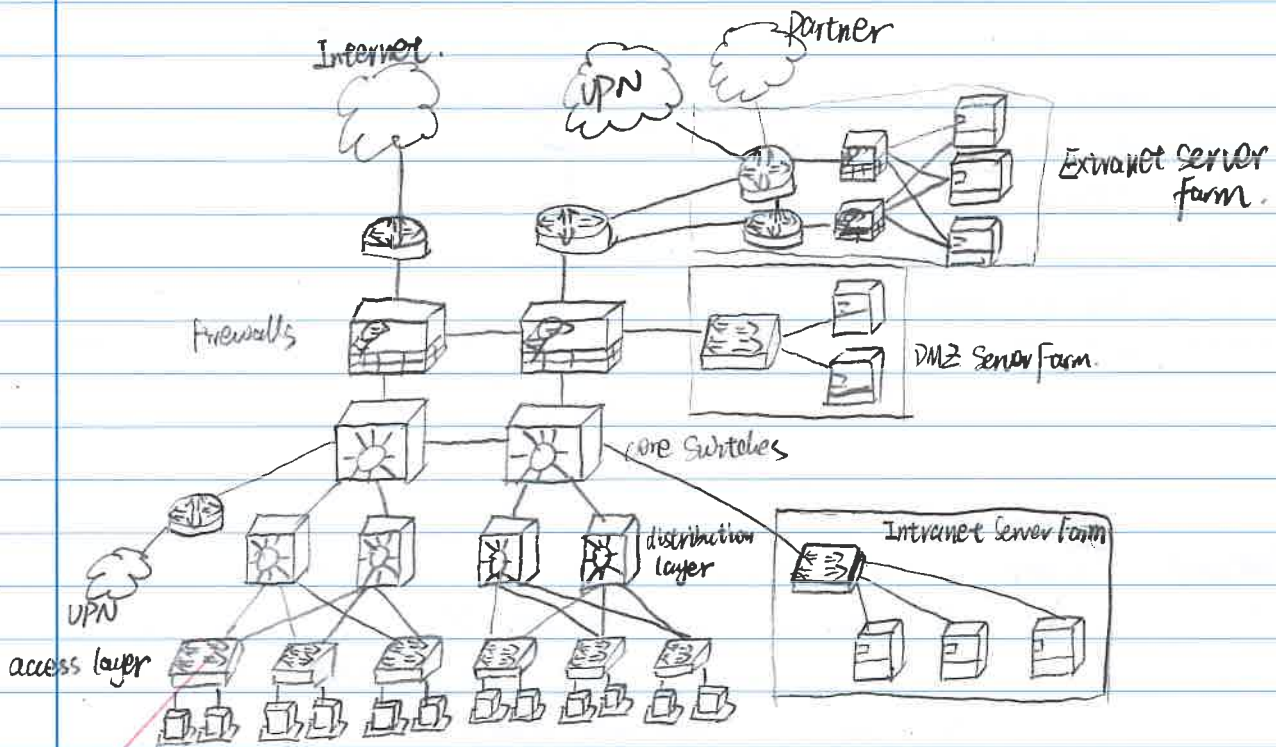
- ① The host sends out a RS message to all routers solicited-node multicast address.
- ② Routers receiving the ^{RA} RS message generate RA message immediately to all nodes solicited-node multicast address.
- ③ The host uses the information in RA to create its local link address and multicast address.
- ④ Duplicate Address Detection: The host sends out a NS message to query if there is the same IPv6 address with it on the same link.
- ⑤ If some host responds it, it means that there is the same IPv6 address and the host should be configured manually.

- Q4 a.
- ① Hubs are used instead of switches (only one broadcast domain)
 - ② ADSL modem is used instead of ISP router.
 - ③ Only one hub in some blocks and single failure may happen.
 - ④ No hierarchical design, which may cause difficulty of network management and trouble shooting.
 - ⑤ No VLANs.
 - ⑥ No subnet mask.
 - ⑦ Functionality of server is not clear.
 - ⑧ No server farm.
 - ⑨ NO DMZ.

- b. Network Manager :
- ① Design the network plan and implement it.
 - ② Design the disaster recovery plan.
 - ③ Ensure all the policies are implemented.
 - ④ Manage the Network Department.

- Network Administrator :
- ① Monitor the performance level of the network.
 - ② Monitor the security of the network.
 - ③ Control the usage aspects of the network.
like what services are used? who use them?
 - ④ Manage the Network account.

C. (Answer of question c is on the next page)



$172.22.1.1/24 \sim 172.22.1.126/24$
 $172.22.1.127/24 \sim 172.22.1.254/24$
 $172.22.2.1/24 \sim 172.22.2.126/24$
 $172.22.2.127/24 \sim 172.22.2.254/24$
 $172.22.3.1/24 \sim 172.22.3.126/24$
 $172.22.3.127/24 \sim 172.22.3.254/24$

Assume that there are ~~300~~ ³⁰⁰ persons and 6 departments.
IP address assignment is above.



12 Pages

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SURNAME: ABDULLA

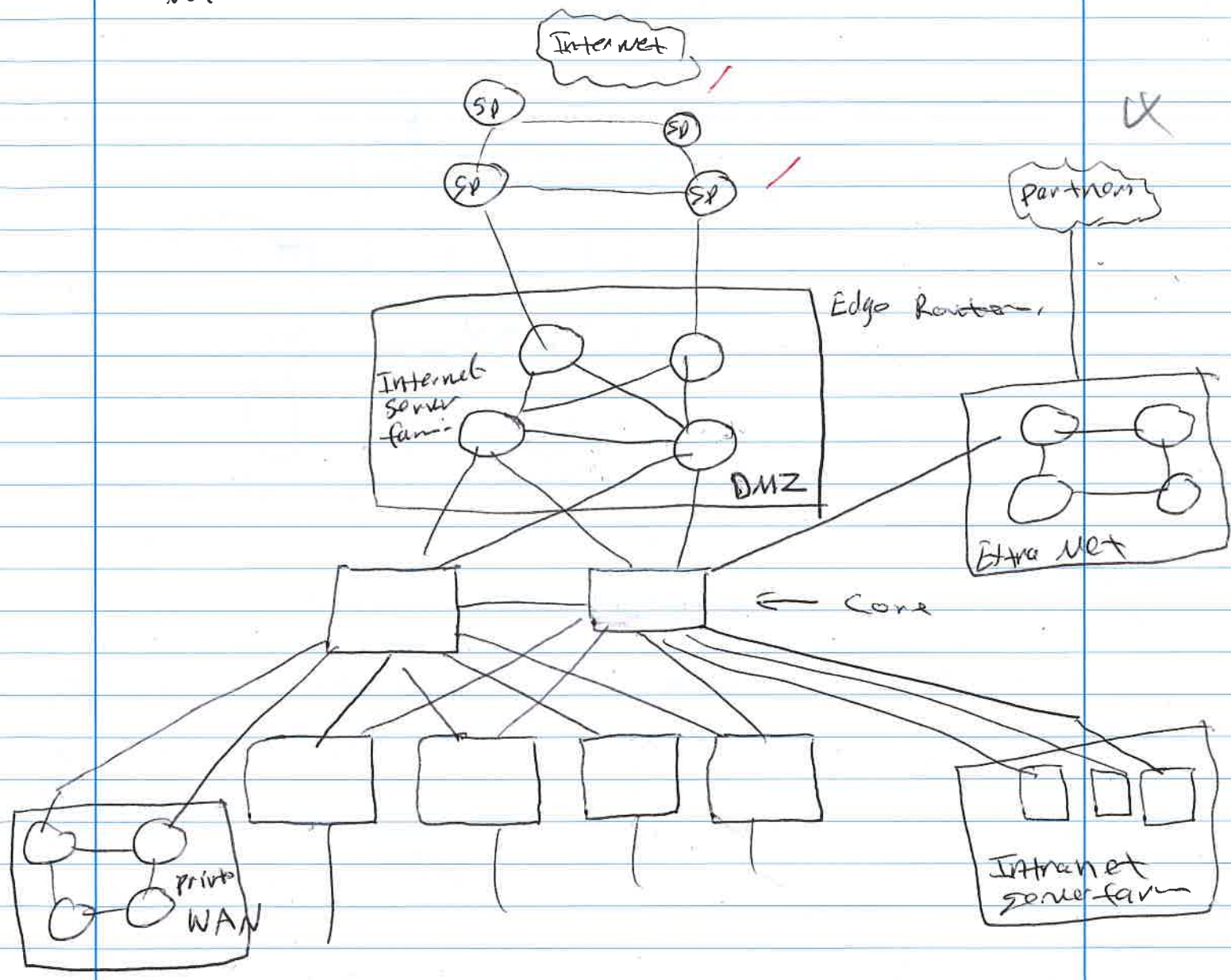
FORENAME(S):

1	Student Number	152058
2	Title of Examination Paper	Network and Data Centre
3	Module Code	ACEA001
4	Date and Time of Examination	17/01/19
5	Examination Venue	Vivian Hall
6	Seat Number	41
7	Number of Answer Books handed in	2

List the numbers of the questions you have attempted	Office Use
1, ~~3, 4~~	11
3	9
4	18
Total	38

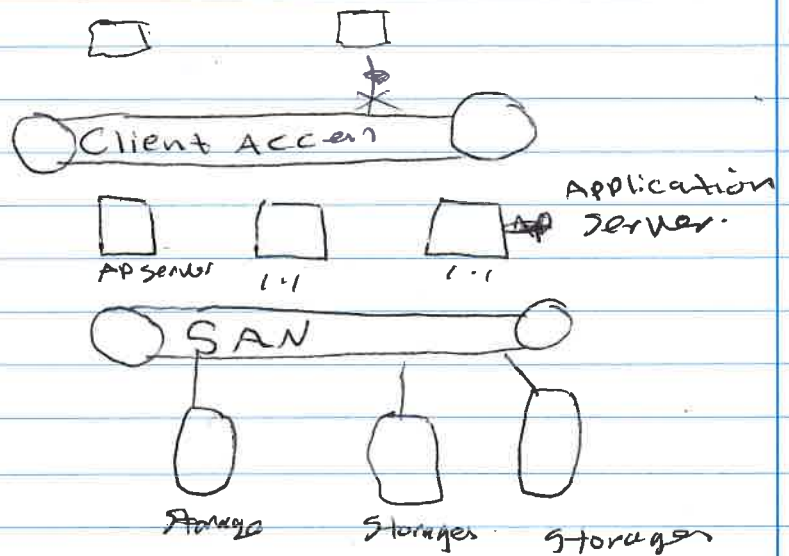
(Gweler yr ochr arall am y fersiwn Cymraeg)

- Q - Internet server farm is sitting somewhere on the Internet.
- It is Accessed by All Internet Community
 - It supports e Business
 - It is Accessed using web Apps
 - It is ~~not~~ part of Enterprise network



b- SAN is High speed Network providing Connection to Block Level Storages.

- Improve Application Availability
- Enhance Connectivity to Storages.



Q3

a. IPV6

- Large IP Addresses ✓
- Eliminating NAT ✓
- Auto Configuration ✓
- Eliminating Broadcasting ✓
- Simplified IP Headers ✓
- End to End Connectivity ✓
- Mobility ✓

6

b. IPV4

- Address Depletion ✓
- ~~Address Depletion~~
- Using NAT ✓
- No Auto Configuration ✓
- Need subnetting to save IP's ✓

State Less Auto Configuration

Local

b- ~~Link~~ Link generated.

- Host send RS to All Routers
- Router Reply with Router Advertisement Announcing the prefix used on the Link
- Host generate address using that prefix
- Host perform DAD
- Address Activated.

3

9

9

Q 4

a-

- No Redundancy All devices Connected to a single Hub
- Bad VLSM
- Equipment from different Vendors
- Too Many Lease Lines
- If the Hub Die everything will Die
- Single point of Failure
- No Redundancy for each Floor
- No Intranet Server farm
- Fire wall ~~can~~ is Directly Connected to the Hub
- NO Vlan's

b- Network Manager

11-

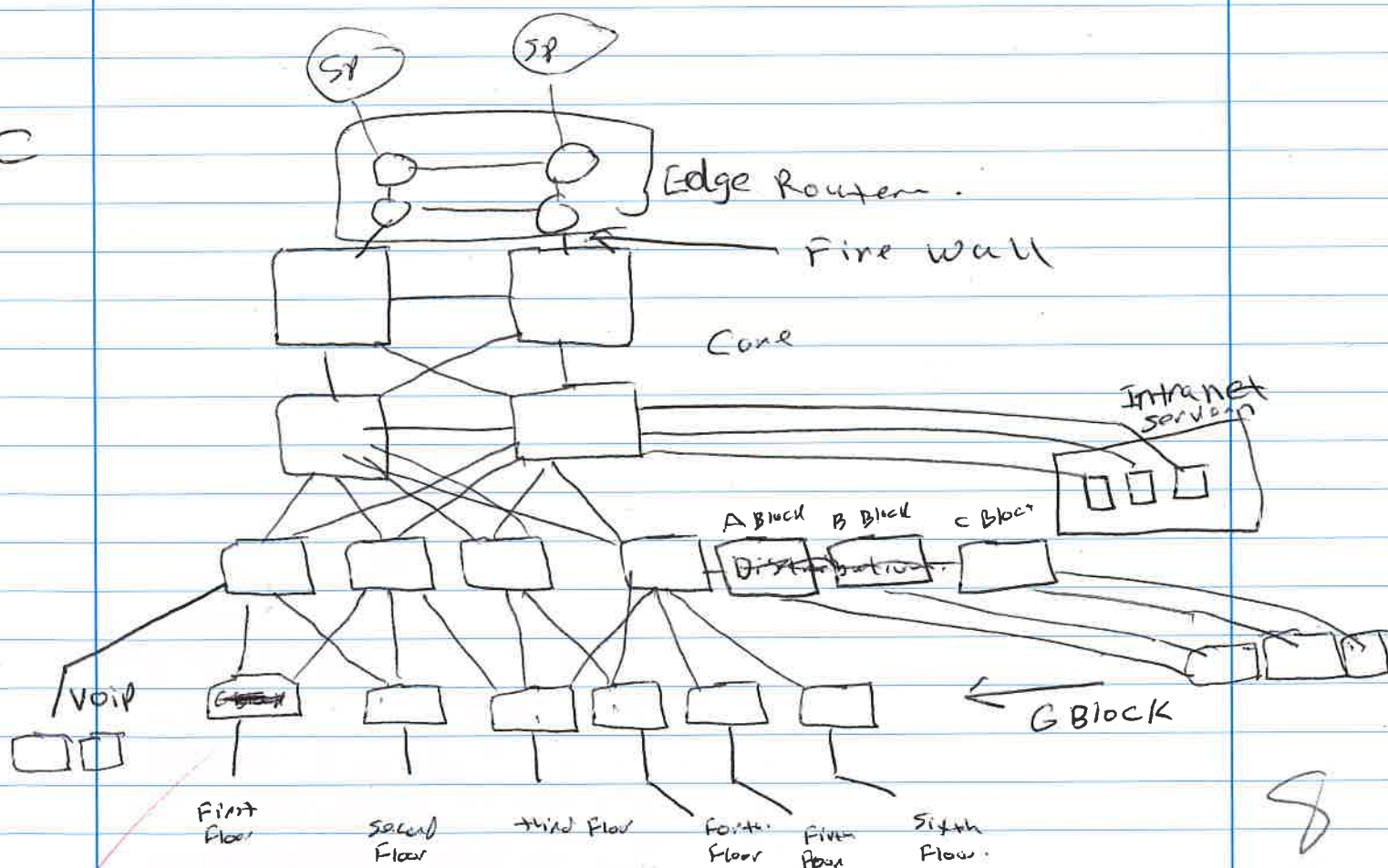
- Designing Disaster Recovery plan
- over view the Network Implementation
- Interview new recruits
- Managing Network Staffs
- Communication with third party partners
- In charge of purchasing new Equipments
- Making Sure All procedures are Implemented
- In charge of training staffs in order to provide good services to End users

b-

ii Network Administrator

- Working with Network Manager for Any Issues
- Implementing ^{Security} ~~Security~~ procedures.
- Configuring New Equipments and also Installing
- Setting Accounts for End users.
- Reporting Any Security Breaches.
- Monitorin Network performance ✓
- In Some Cases Filterin Internet Traffic
- Reporting regularly to Network Manager.

c



④ 4 Continue.

problem and weakness - Measure to correct

C

i - better VISM

- Eliminating the single point of failure for Each Floor.
- Decreased the ISP Line to 2 connection
- Used All Cisco Equipments instead of ~~Multi~~ Multi Vendors.
- Designed Intranet Server farm
- Designed vlan for VoIP
- No Need for ADSL Modem, ~~Cisco Router~~
Edge Routers Implemented -
Cisco
- Fire Wall Implemented at the Edge Routers
- Implemented different Vlan for Each Building and Each Floor to Eliminate the Broadcast
- Each Floor and Building have better redundancy.



12 Pages

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FORENAME(S): Ross

1	Student Number	P151366
2	Title of Examination Paper	Network and data centre management
3	Module Code	ACCA 6001
4	Date and Time of Examination	16/01/19 9:00
5	Examination Venue	Vivian hall dylan thomas centre
6	Seat Number	G001
7	Number of Answer Books handed in	1

List the numbers of the questions you have attempted	Office Use
Q4	18 1/2
Q2	5
Q1	10 1/2
Total	34

(Gweler yr ochr arall am y fersiwn Cymraeg)

45°



Q4

a

only 1 fire wall depending only 1 of 2
outwards connections from the main
Server.

1 Point of Failure if the main Server fails, no
backup connections to the Servers.

No IP Scheme to easily organise and
maintain Subnets of the business

Multiple brand network devices can be
harder and more costly to manage. can
run into compatibility issues

6

excessive use of fibre connections can
increase costs assuming some connections
can operate just fine using ethernet connections.

Potential inefficient use of network devices.
multiple devices per floor/room could
be substituted for 1 stronger device saving
money overall.

No indication of IOT implementation

No wireless access points available

No easy to read/interpret Zoning
layout to easily view/amend network
layout. ~~NO DMZ areas~~

if using fibre cables it should be utilised on the
links coming from the ISP to the business, not on
links within the business

Q4 b

i Network Manager

Oversee any changes to the running/
maintaining of the network

ensure networking team is sufficiently trained
and capable of tasks set, including merging
Sure there are enough engineers required for
the tasks set.

approve or deny any decision that may
affect the business network

Network administrator

Maintain the network including!

- Hardware maintenance checks/updates
- Software updates
- Security monitoring
- monitor network activities

Q&A:

i 1 Firewall defending 1 of 2 outward lines from the business. 1 line is not under protection of a firewall which can compromise the network.

assuming the firewall is capable of defending both ~~lines~~ lines then a simple reconfiguration may be enough. however if that is not the case, either a new firewall must be added to the other connection, or a stronger firewall which can accommodate both lines should be implemented, whichever is more practical and/or cost effective.

There is a single point of failure to the connection of the whole business to the ISP connection. Layers of redundancy should be added to ensure that a failure can result in the substituting of a backup network device to ensure uptime, or as a worst-case scenario, a single room/floor loses connection instead of the whole business.

No IP Scheme makes the whole network ~~harder~~ harder to manage. a simple ~~Sub~~ Subnetting Scheme could allow easier management of VLANs set up for each room/floor/building. this can also increase security of the network.

Having multiple different branded network devices can increase maintenance costs. maintaining ~~so~~ plans can cost upwards of £10,000 per year for 1 manufacturer, you don't want to be paying multiple manufacturers that amount of money when you can be simply paying 1 maintenance plan for all devices on the network.

Q1 C
1

having multiple brands of devices in your network can also cause compatibility issues as some devices may ~~not~~ perform worse or not at all with other brands of hardware. It is usually always best practice to stick to 1 brand of network devices to ensure maximum compatibility and the ability to upgrade in future, while also saving money on maintenance plans and spend less on training employees to learn how to work with multiple brands.

There is excessive use of fibre connections in this network, which can be expensive and inefficient. If fibre is to be used, it should be implemented on the links coming from the ISP ~~into~~ into the business. This allows the business to decide which areas of the network can benefit the most from the higher speed connections. Some areas of the network may be able to operate at maximum capacity just fine using a normal ethernet connection over fibre connection, so this is an area where money can be saved. ~~if possible~~.

There is potentially a waste of network resources due to the number of devices in each room/floor. To maximise efficiency a network traffic test could be used to ensure expensive high power network devices are not being under utilised in some areas of the network. It may also find that some areas of the network require more powerful devices which could improve productivity of the business.

14C
1

There is no indication of any IoT implementation. IoT in a business can lead to efficient energy saving, increased productivity for certain tasks, and increased safety for employees in the form of fire safety devices, lighting, automatic door/gates. Overall IoT can save a business a lot of money and make the workplace more safe and efficient.

There seems to be no wireless capabilities on this network. Wireless is almost a must these days for a business as internet tasks need to be carried out on laptops, tablets and phones. It is important to conduct wireless access checks when implementing wireless in a business site to ensure ~~minimum~~ minimum block spots and good signals ~~in key areas~~ strength in key areas.

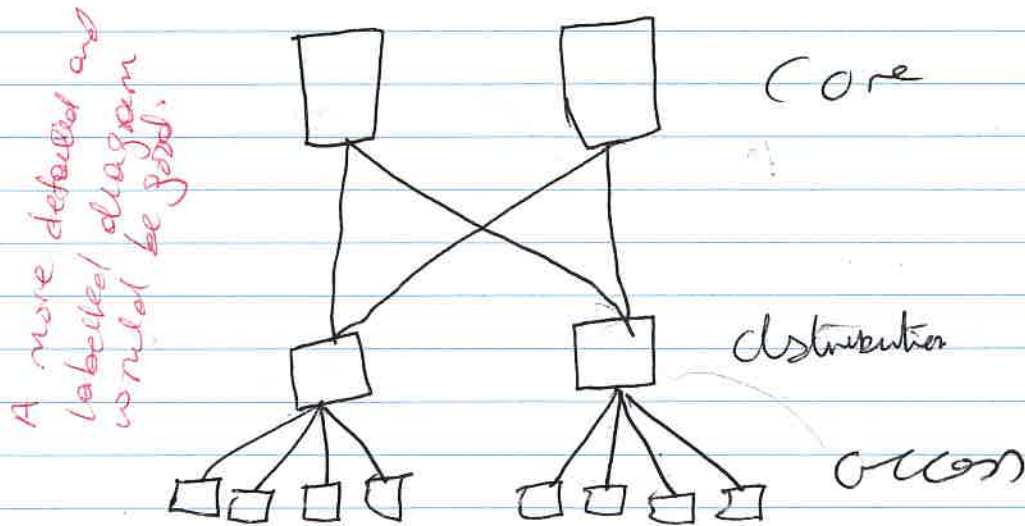
There is no zone organisation of this network meaning the network setup has to be re-analysed. This can ~~cost~~ slow down the process of reconfiguring the network and/or ~~cost~~ upgrading the network. A DMZ could be implemented at the area where the ISP connection comes into the business to improve security.

The implementation of VoIP could work well with a Power over Ethernet System. This saves time and money on cables, implementation time and cable management. APB & Server could also be implemented to increase performance and efficiency of the network.

Apart from your diagram you have not done a diagram

10

18/2

Q2
a

The Storage Layer of a network holds data on Servers. ~~which are accessed~~ This data can be stored on multiple different types of media. As of late, SSD Storage is becoming the standard due to the faster available speeds and also the storage size to physical size ratio. maximum 1m x 1m of SSD storage can hold ~~multiple order~~ order of magnitude more data than 1m x 1m of HDD Storage.

The Transport Layer of the Data center architecture holds the method of transport of data from the Storage Layer through to the users of the network. Speeds of internal networks can be up to ~~10 Gb/s~~ 100 Gb/s to a single machine over fiber and 10 Gb/s transport speeds between servers can reach huge speeds due to ~~the~~ the utilization of etherchannel. ether channel allows a ~~router~~ switch to combine multiple ports to form 1 virtual connection capable of transferring massive amounts of data at once, limited only by the amount of cables available to the switch.



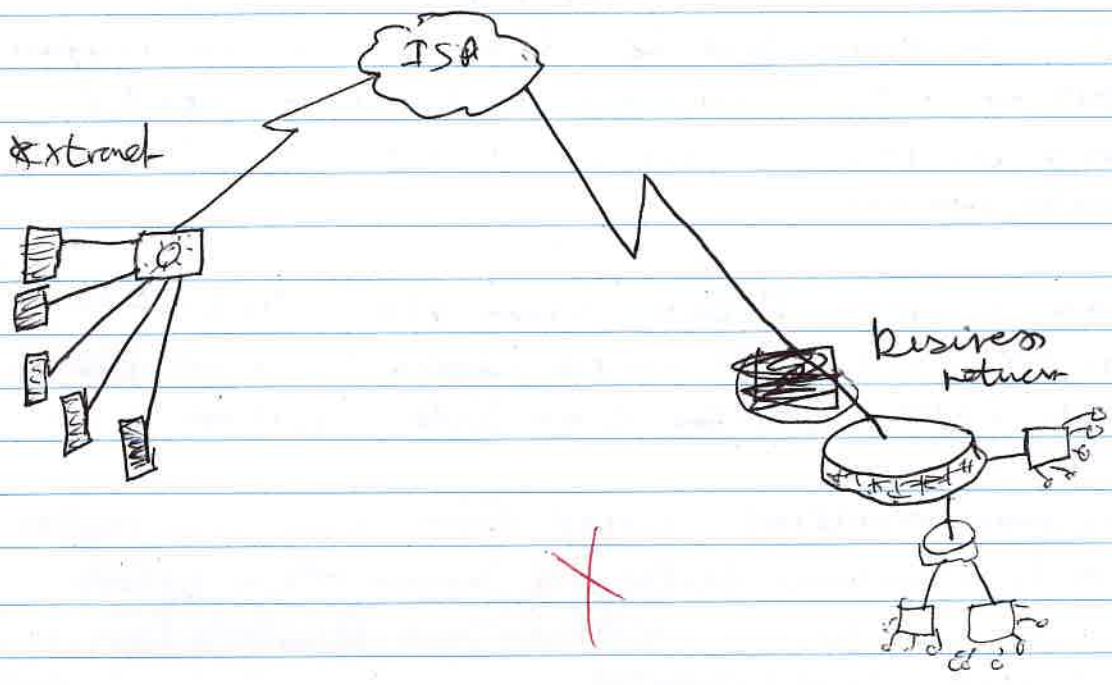
Q2

b) Clusters, is the process of using a much processing power of a super computer to process massive amounts of calculations in short amounts of time. This is accomplished by utilizing ~~many~~ multiple high power CPU/GPU. In a single super computer then allocating portions of that power to ~~the~~ process data calculation. By connecting multiple super computers together ~~it is~~ possible to form a cluster or multiple super computers to speed up processing time. Businesses can cut down processing time from days with a time down to just hours or minute of time, increasing productivity massively.

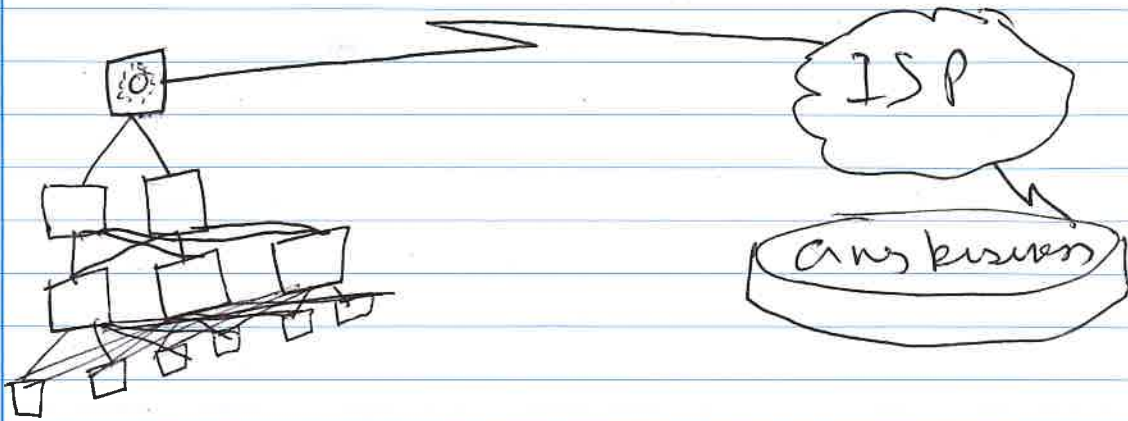
✓

Clusters may use a hypervisor to allocate processing power to business in various amounts. Some business may require small amounts of processing power while other may require huge amount of ~~power~~ processing power.

c



5

Q1
a

an internet Server Farm allows offsite storage of data on a Server accessible through an internet connection.

The Server Farm may be used for web apps, software apps, data backup, website hosting, databases, storage etc.

An internet Server Farm makes use of economies of Scale. A Server Farm may be able to provide better performance due to better conditions for server placement. A business may not have a good area to put a server due to climate conditions, money constraints, employee restrictions. So it may be more cost effective to use a Server Farm.

A Server Farm may host multiple business data or software/website needs for a fraction of the price of on-site servers.

By using an internet Server Farm, you don't require staff to maintain/update the servers. This is less work on the business employees and potentially less maintenance costs overall.



Q1

b

Storage-area Network

A Storage area network is a group of Servers whose main Purpose is to Store data. This data can be data backups, database Storage or any kind of mass Storage needs.

The Storage area network can be accessed via an internet connection & allows off Site Storage for a business which can allow some data recovery in the case of a natural disaster.

A SAN can be encrypted and only accessible by users with appropriate credentials. ~~It~~ usually through VPN to allow secure encrypted connection.

multiple SANs may be linked to store Symmetrical data. backups for example RAID 2/1/0. This provides extra layers of redundancy.

Storage area networks may be a primary Storage solution for a business, or it may run alongside a business's own Storage methods.

A Storage area network can use rows of blade Servers to store data with either SSD or HDD technology.

10k

10 1/2