

Examination Answer Book

12 Pages

Instructions to candidates

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1	Student Number	171381	List the numbers of the questions you have attempted	Office Use
2	Title of Examination Paper	Advanced Routing	1	22✓
3	Module Code	CSAC6001	2	5✓
4	Date and Time of Examination	21/02/10/01	3	16✓
5	Examination Venue	Coleg Sir Gâr	5	16✓
6	Seat Number		9	13✓
7	Number of Answer Books handed in	1		
			Total	52

(Gweler yr ochr arall am y fersiwn Cymraeg)



PRIFYSGOL CYMRU
Y Drindod Dewi Sant
UNIVERSITY OF WALES
Trinity Saint David

Llyfr Atebion Arholiadau

12 Tudalen

Cyfarwyddiadau i Ymgeiswyr

1. Rhwch yr holl wybodaeth y gofynnir andani yn y blychau isod.
2. Rhwch eich enw yn y lle a ddarperir i'r dde a seliwch i guddio eich enw.
3. Rhaid i'r atebion fod mewn llawysgrifen ddarlennadwy. Gall yr Arholwyr naill ai anwybyddu script amharlennadwy, neu drefnu iddi gael ei theipio a chael yr ymgeisydd i dalu.
4. Ysgrifennwch eich atebion mewn inc.
5. Dechreuwch bob ateb ar dudalen newydd. Gwnewch unrhyw fras nodiadau yn y llyfr atebion a thynnu llinell drwyddyn.
6. Ni ddylid rhwgo unrhyw ran o'r llyfr hwn; rhaid ei gyflwyno yn gyfan.
7. Os defnyddir mwy nag un llyfr, rhwymwch hwy gyda i gilydd gan ddefnyddio'r tagiau sydd ar gael oddi wrth y gwyllwyr/gwyllwyr.
8. Rhaid dychwelyd pob llyfr. Ni chaniateir mynd â llyfrau atebion, wedi eu defnyddio neu heb eu defnyddio, allan o'r lleoliad arholi o dan unrhyw amgylchiadau.

1	Rhif Myfyrwr		Rhestrwch rifau'r cwestiynau a ymgeisiwyd gennych	At Ddelbenion y Swyddfa
2	Teitl y Papur Arholiad			
3	Cod y Modwl			
4	Dyddiad ac Amser yr Arholiad			
5	Lleoliad yr Arholiad			
6	Rhif Sedd			
7	Nifer y Llyfrau Atebion a gyflwynwyd			Cyfanswm

A wnewch chi lenwi'r rhan hon a'i SELIO cyn i'r arholiad ddechrau.

Cyfenw _____ (LLYTHRENNAU BREISION) Enw(au) cyntaf _____

1a) OSPF assigns a router ID based on IP address, bandwidth and load of a router. This router ID is used when running the SPF algorithm for calculating the 'distance' of a route

1b) Route Summarisation ^{uses} an IP address to represent multiple destination routes. The main benefit of this is that there are fewer entries in the routing tables of every router. ~~There are also fewer updates when a route changes as another route which is represented by the summary address remains.~~ The smaller routing tables result in fewer updates as there are fewer routes to change update.

2a) Static routing involves explicitly ~~defining~~ defining routes and adjacencies within networks. In contrast, dynamic routing relies on a protocol to automatically ~~populate~~ populate a routing table and calculate the best route to a destination. Static routing is easier to configure, but is ill suited for ~~very~~ medium-sized or large networks ~~due to the~~ increasing number of routes that must be specified. Dynamic routing is slightly harder to configure, but is far more scalable.

3a)

Successor - A neighbor router with the ~~shortest~~ lowest calculated cost to reach a destination.

Feasible Distance - The ~~cost~~ lowest cost path between the local router and the destination.

Feasible Successor - Neighbor router with the second lowest cost path ~~to a destination~~ loop-free path to a destination.

Reported/Advertised Distance - The ~~cost of the~~ ^{cost of the} lowest cost path between a neighbor router and a destination.

Feasible Condition - A condition which is met when a neighbor ~~router~~ neighbor (non-successor) router's reported distance is lower than the ^{current} successor's cost in the topology table.

3b) In a topology table, each route is In EIGRP, a route is given a State ~~available~~ (Stored in the topology table). P indicates that the interface is in passive mode (EIGRP is not running an algorithm). A shows that EIGRP is currently calculating the distance of a route via that interface.

5a) An Autonomous System is comprised of interconnected networks within a large area or an organisation.

5b) Interior Gateway Protocols are used to route ^{over} ~~between~~ networks within an autonomous system. RIP, EIGRP, IS-IS and OSPF are examples of IGP's.

5c) An Exterior Gateway Protocol is used ~~for~~ when two or more autonomous systems need to communicate with each other. BGP (Border Gateway Protocol) is the most common ~~example~~ example of an EGP.

5d) A Single Homed network ~~is~~ are System features a single link between two routers.

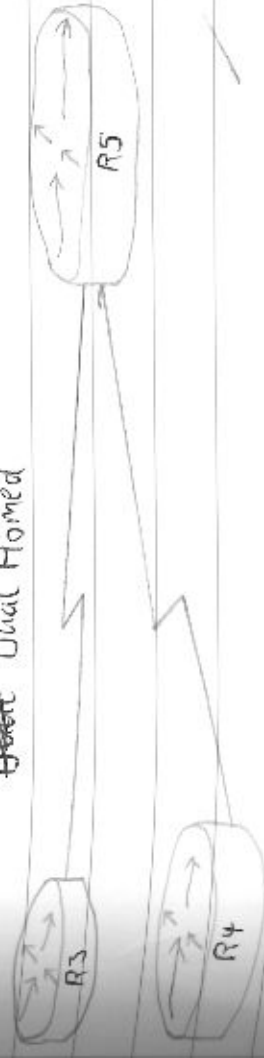
Dual Homed refers to one network having two links to routers in another system.

Multi-homed systems feature links between two or more routers.

Single Homed

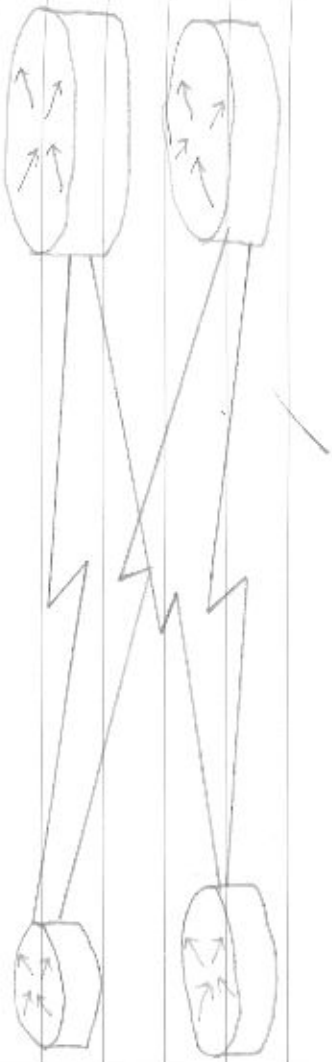


~~Single~~ Dual Homed



5d)

Multi-Homed



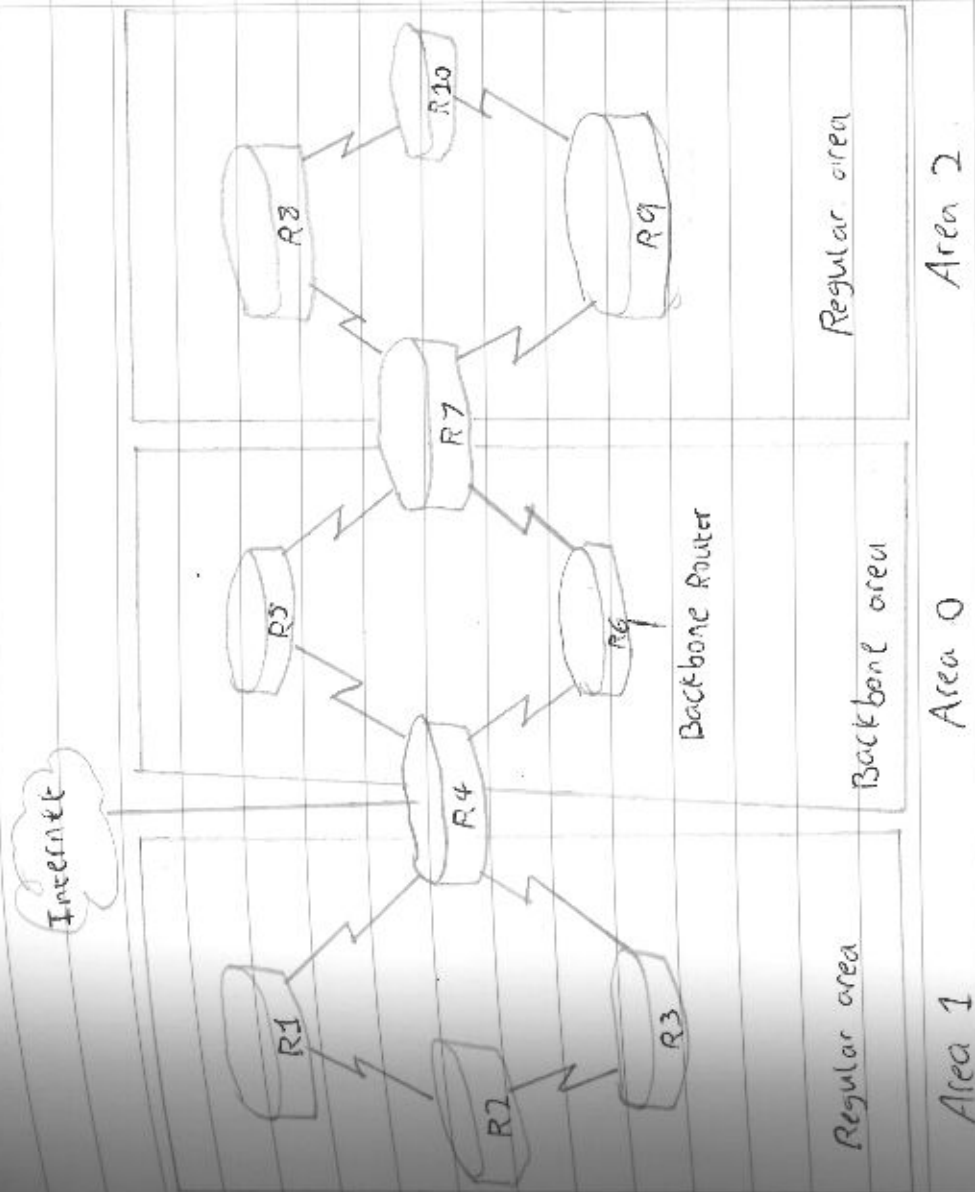
6a) In multiarea OSPF, a Backbone/Transit area ~~is~~ is the area in which backbone routers are assigned and facilitates inter-area routing. Routers sit between the backbone area and a regular area and serve as the gateways between OSPF areas.

6b) Internal router - A router within a regular OSPF area.
Backbone router - A router which is part of the backbone area, carries LSA information between Area Border Routers.

Area Border Router - Interfaces on this router are assigned different OSPF areas and ~~send info~~ communicate between Backbone and Internal routers.

Autonomous System Boundary Router - An area boundary router which also links to another autonomous system or a non-OSPF router.

6b)



R4 is an Autonomous System Boundary Router because it links to an external system (the Internet)

R7 is a Area Border Router which sits between Area 0 and area 2.



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[illegible]

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2	Tecil y Papur Arholiad	
3	Cod y Modwl	
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Cyfenw _____ (LLYTHRENNAU BREISION) Enw(au) cyntaf _____

A 1.

a. In order for OSPF to derive its router ID, the first criteria that is checked is whether the router ID has been specifically set (this may be done by an administrator). If this criteria is not met, OSPF scans the router for the highest interface (IPV4) that is in active use. OSPF will select this as the router ID.

6. The benefit of route summarisation is that it reduces the computing overhead of detailing all of the interfaces that are connected to the designated router. If the entire route was computed it would mean storing all of the information on the designated routers LSDB, and forwarding this information to the core router, taking up more computing overhead & bandwidth.

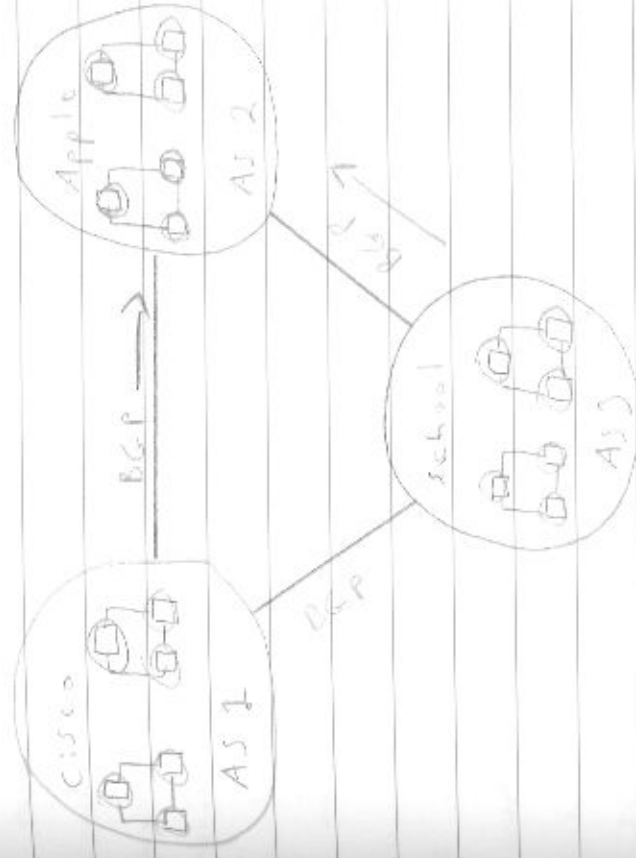
2. a. Static routing means that the addresses on the network are routed by using the routing information that is held on each individual router, and the routing system is not aware of the structure of the network. ~~The advantages of static routing are:~~ ~~one of the advantages of static routing~~ ~~is that it is inherently easier to understand. This is because it doesn't include the use of complex algorithms or routing protocols. Another advantage of static routing is that it is easy to add new devices to a network that implements static routing, the admin simply has to connect it to a router and give access to the PC, the PC is given an IP address and the router will route its information automatically.~~

One of the disadvantages of static routing is scalability. As a network increases in size, the computing overhead increases because there are more devices that need information routed. As a result, once there are too many devices on a network the performance will begin to diminish. This leads on to another disadvantage; maintainability. Static routing does not have knowledge of the topology, therefore if a link on the network is broken it will simply stop sending & receiving information and the problem will only affect the devices that are connected. The administrator would have to find the problem by manually searching for the source of the problem.

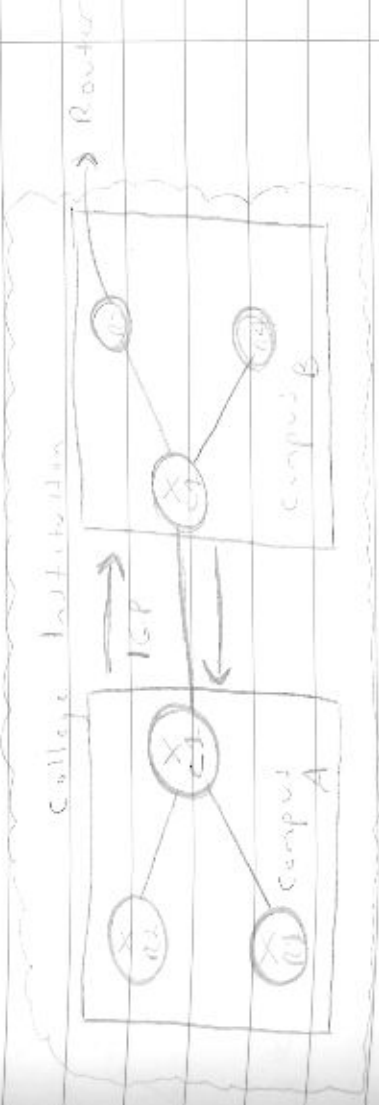
However, dynamic routing means that devices on the network have knowledge of the system as a whole. If an interface stops sending & receiving information, there is a high chance that even some of the devices that are not directly connected to the problem will be aware of it, and this will be evident in the routing table. This is an advantage of dynamic routing, because it becomes easier to find the problem. Another advantage of dynamic routing is that it dynamically responds to problems. If a link to the central router is broken, the system will simply re-calculate and continue functioning. Dynamic routing is also scalable, it enables the creation of intranetworks, splitting a single network into many but using the same routing domain. The disadvantages of dynamic routing include the financial cost. Complex routing domains require many additional devices to

function properly, costing a lot of money. ~~As well as this, another disadvantage is that~~

5. a. An Autonomous System refers to a group of networks that exist under the same domain such as an organization or business.



b. An IGP would be used to route information inside or within an AS. For ~~example BGP~~ ~~BGP~~ Examples of IGPs include both distance vector and link state protocols such as EIGRP, RIPv2, OSPF & IS-IS. An IGP would be used if for example if you wanted to route information between campuses under the same college institution.



C. An EGP (Exterior Gateway Protocol) would be used to route information between ASes, in different institutions or organizations. BGP (Border Gateway Protocol) is an example of an EGP.



d. Single Homed refers to a single enterprise being connected to an ISP (Internet Service Provider).



Dual Homed refers to two routers within the same enterprise being connected to an ISP.

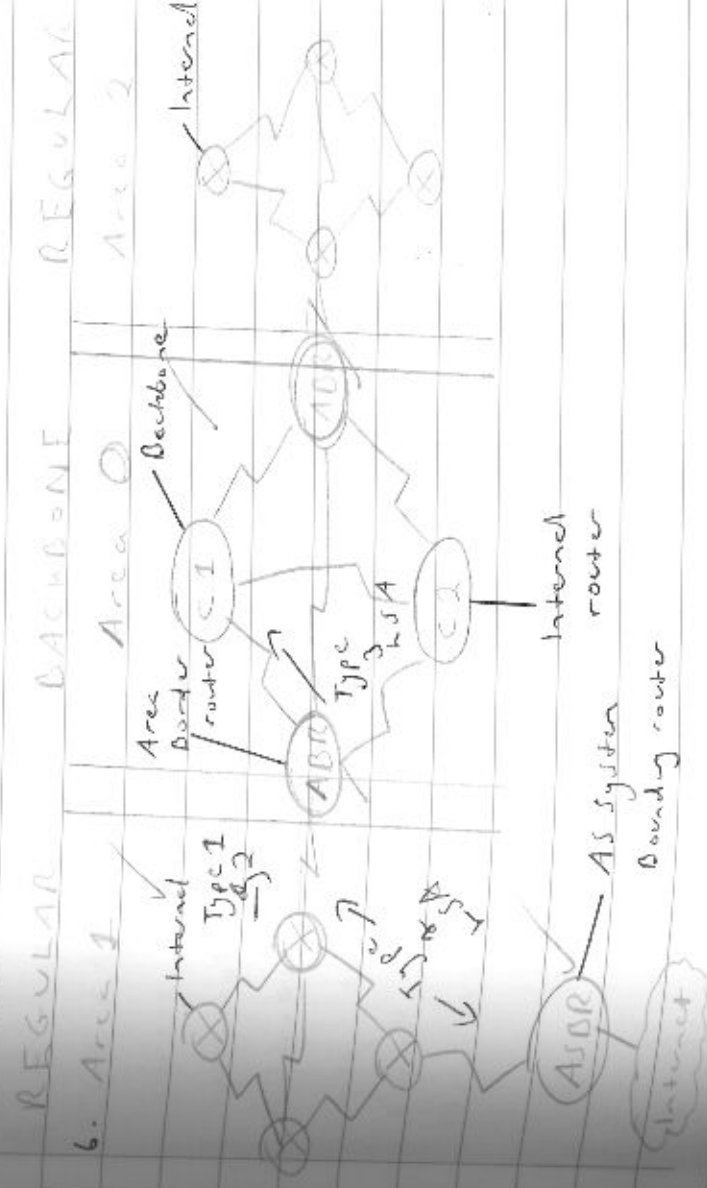


Multi Homed refers to two routers within the same enterprise being connected to multiple ISPs.



6. a. Backbone (Transit) refers to the central hub of an OSPF multi-area network. The Backbone area does all of the heavy lifting with regards to storing information within an LSDB of all other areas of the network. The Backbone area represents the core of the network that all of the other areas must connect to. The Backbone is responsible for the core logic of the OSPF routing protocol, and has knowledge of all of the devices connected to the internal network. The backbone receives Type 3 LSAs (Link State advertisements), containing the routing information of each area of the network.

The Regular (Non-Backbone) area of an OSPF network refers to the areas of the network where hosts can connect to the network. This area of the network enables host routers to send Type 1 & Type 2 LSAs between each other, building up an image of the neighboring & adjacent devices, which is then sent to an ABR for translation. This area does not handle as much information as the Backbone area.



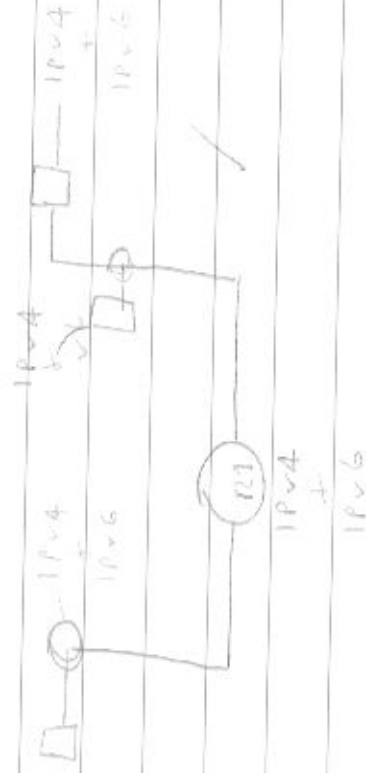
An Internal Router refers to a router that only communicates with other routers from the same area.

A Backbone Router refers to a router that lies within Area 0 - the Backbone, and only communicates with other backbone routers.

An ABR refers to a router that lies between areas, and enables an area to send routing information to another area.

An ASBR refers to a router that communicates with other routers from outside the OSPF network.

7. a. Dual Stack refers to devices running both IPv4 & IPv6 in co-existence and simultaneously. This enables all addresses to communicate with each other, regardless of the version of IP.

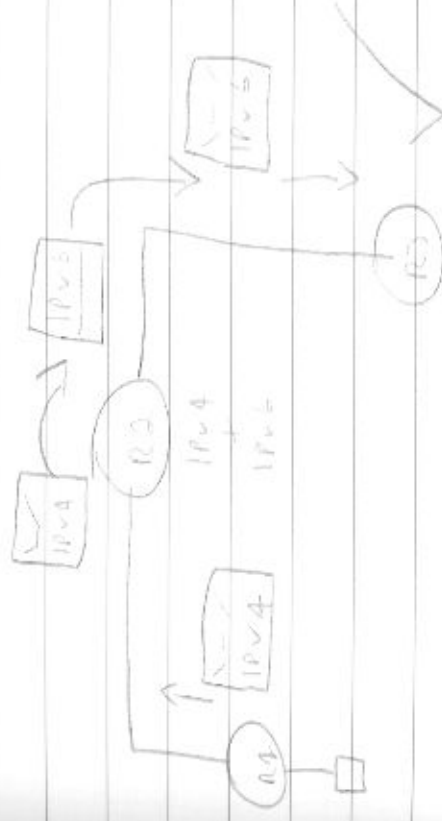


Tunneling refers to being able to send an IPv6 packet through a network that implements IPv4 by encapsulating the IPv6 packet inside the IPv4 packet.

~~An Internal Router refers to a router that~~



Translation refers to the translation of an IPv4 address into an IPv6 to enable the packet to reach its destination. NAT is often used to facilitate this.

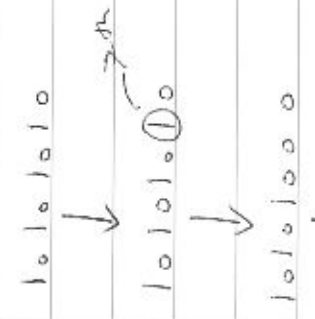


6. In order to generate an Interface ID from the EUI 64, the following steps are taken. The MAC address that identifies the device is split into two segments, the OUI & the unique identifier. A padding hexadecimal is placed in between the two segments (FFFF) and the LV 7th digit is flipped over, leaving a new identifier. This process is shown overleaf.

AA: 00: CC: 00: EE: FF
AA: 00: CC: ⁰⁰FF: FE: EE: FF



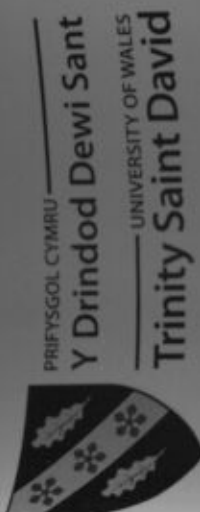
The padding is placed here.



A8: 00: CC: 00: FF: FE: 00: EE: FF

Interface ID.

8/ 8



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5	Examination Venue	Coleg Sir Gar	5	19/9
6	Seat Number		7	20/10
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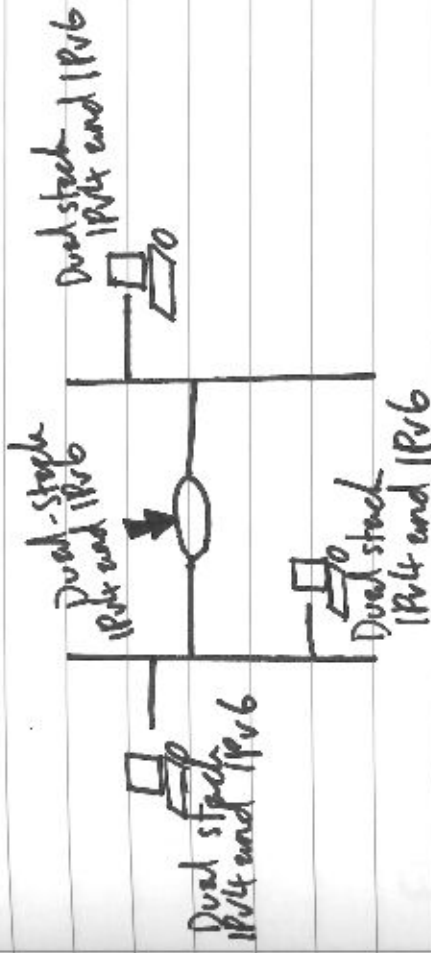
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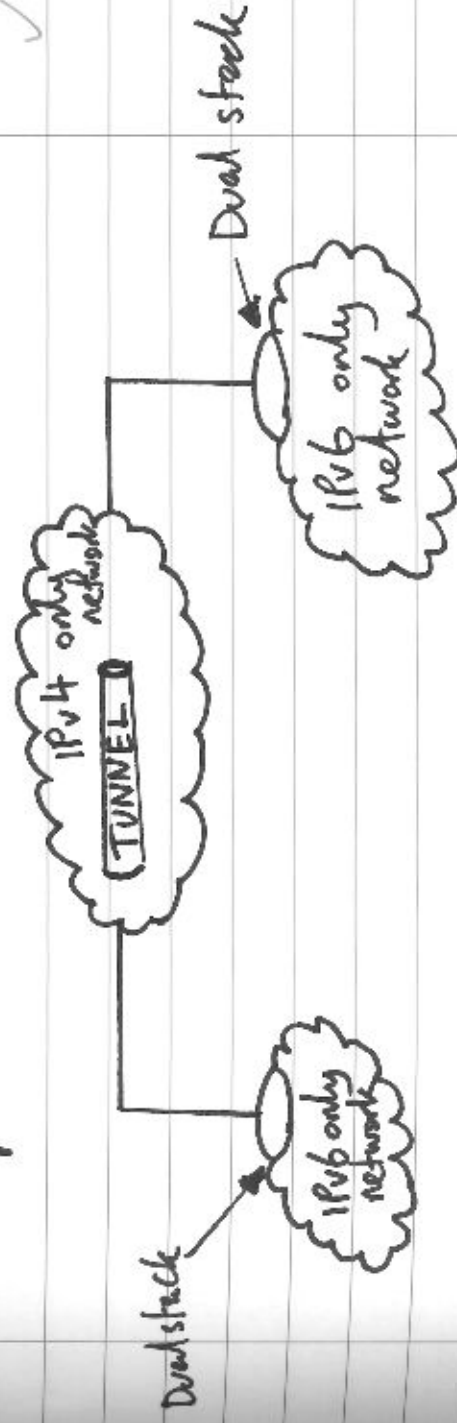
7a DUAL STACK

Dual stack allows both IPv4 and IPv6 to coexist on a network segment. It achieves this because the router runs both the IPv4 and IPv6 protocols ~~to~~ simultaneously.



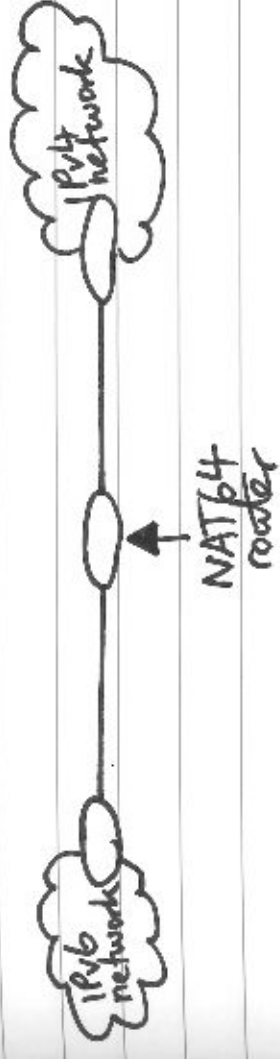
TUNNELING

Tunneling is a method used to forward IPv6 packets over an IPv4 network. It does this by encapsulating the IPv6 packet inside an IPv4 packet.



TRANSLATION

This method allows IPv4 and IPv6 networks to communicate with each other via a NAT64 router. The router uses a translation method similar to NAT for IPv4 to translate the IPv6 packets to IPv4 packets and vice versa.



b EUI64 generates an interface ID in the following steps:

- Takes the 48 bit MAC address of the client device
- Splits the MAC address into two 24 bit segments
- Inserts the hexadecimal values "FF:FE" ~~into~~ between the two segments.
- ~~Converts the~~ Converts the first 8 bits of the MAC address into binary
- Flips the 7th bit (or V/L).
- Converts the ~~first~~ 8 bits back into hexadecimal form to create the interface ID.

Please see figures 3 and 4 on the next page.

FIGURE 3.

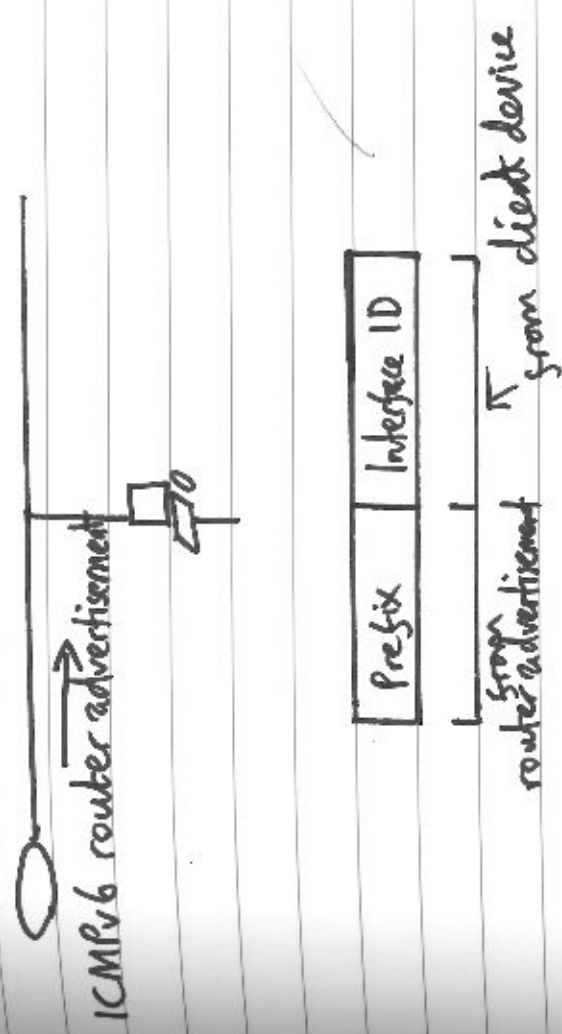
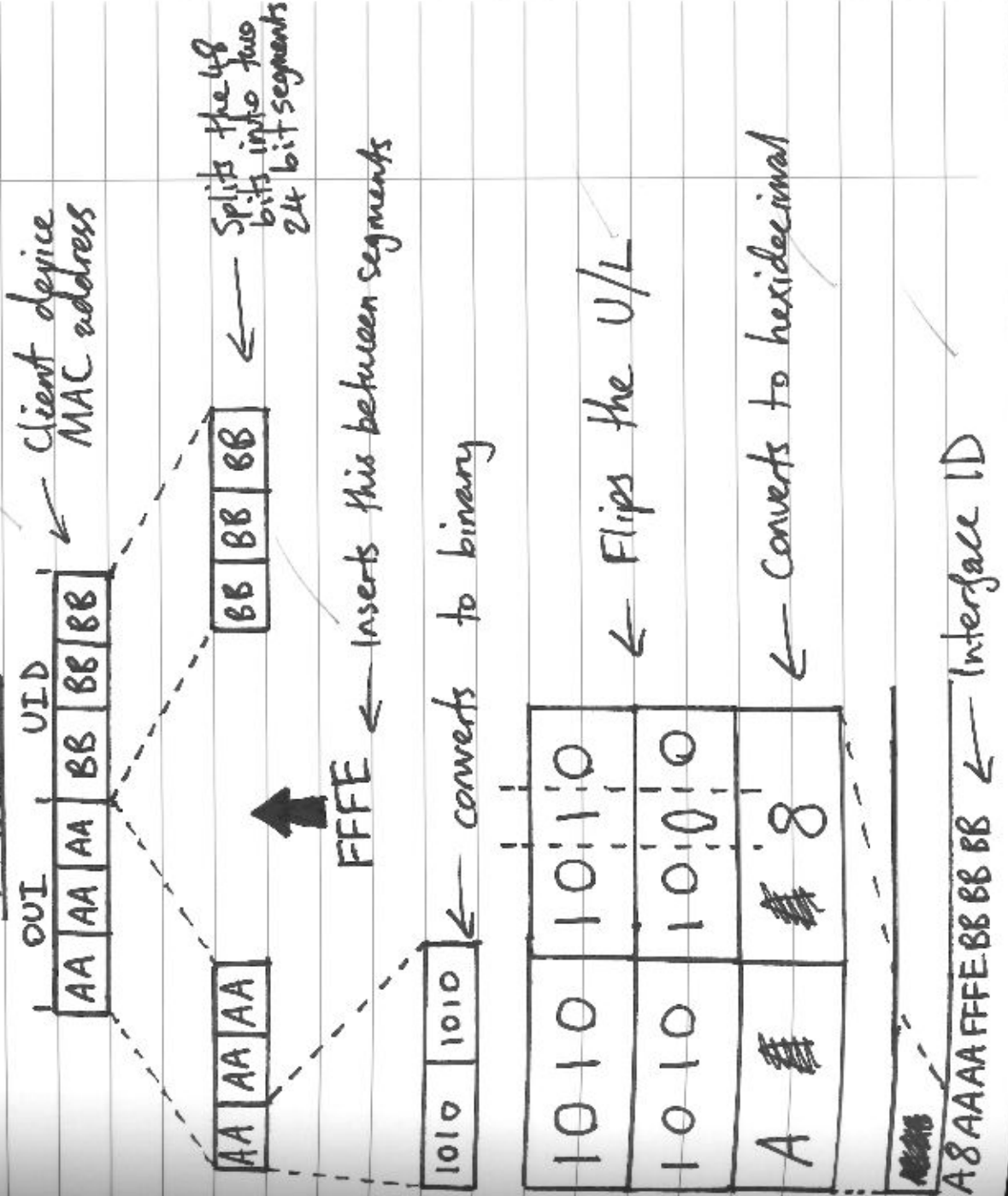


FIGURE 4.



PULL & TEAR

PATENT PENDING

FOR ADMINISTRATIVE USE ONLY, CAREFULLY REMOVE PERFORATED STRIP

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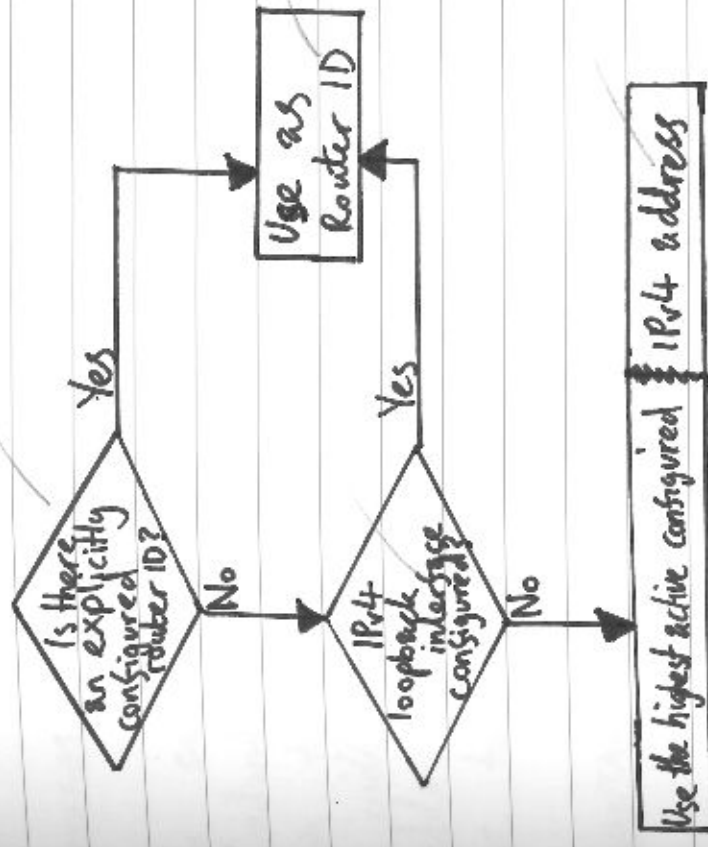
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7	Nlifer y Llyfrau Atebion a gyflwynwyd	Cyfanswm	

A wnewch chi lenwi'r rhan hon a'i SELIO cyn i'r arholiad ddechrau.

Cyfenw _____ (LLYTHRENNAU BREISION) Enw(au) cyntaf _____

1a



6/6

b Route summarisation advertises a summary route instead of a number of specific routes. This results in less entries in the routing table, meaning less overhead and traffic for the network.

4/4

2a

STATIC ROUTING

ADVANTAGES:

- Ideal for smaller networks ✓
- Less complex than dynamic. ✓
- More secure due to no automatic/multicast updates ✓
- Less overhead on the network. ✓

DISADVANTAGES:

- Not scalable. Not suitable for larger networks.
- No redundancy. Physical intervention is required to reroute traffic.

DYNAMIC ROUTING

ADVANTAGES:

- Perfectly suited to larger networks
- Adds redundancy. Additional routes are added dynamically and in the case of a link being unavailable, the traffic will be automatically rerouted.
- Scalable
- Easier to maintain and update.

DISADVANTAGES:

- Less secure due to multicast and broadcast updates.
- More overhead for the network.
- More complex than static routing. More difficult to initially set up.

3a

Successor

The successor is the lowest-cost route to a destination network. It is the primary route that EIGRP will use for packet forwarding.

Feasible Distance

The FD is the lowest calculated metric to a destination network from the local interface.

Feasible Successor

The FS is a neighbour with a loop-free backup route to the same destination network as the successor.

Reported Distance

The reported distance, or advertised distance, is an EIGRP neighbour's feasible distance to a the destination network.

Feasibility Condition

The feasibility condition is met when a neighbour's reported distance to the destination network is lower than the local router's feasible distance to the same network.

b The "P" in the figure indicates that the DUAL algorithm is in a passive state. This means the a successor(s) has been identified for the destination network.

If the figure instead displayed an "A" in the table, that would indicate that the DUAL algorithm is in an active state. This means a successor has not been identified and DUAL is working to find one.

5a An autonomous system is a network or collection of networks that are managed and supervised by a single entity or organisation.

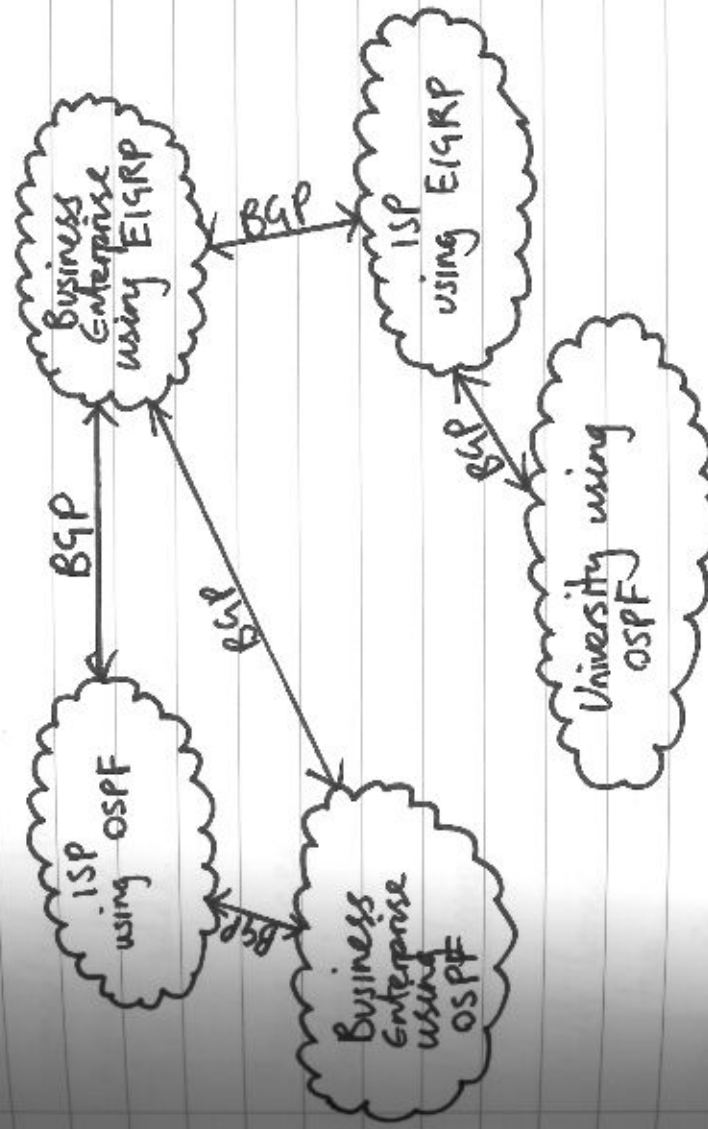
b An Interior Gateway Protocol (IGP) would be used to exchange routing information between gateways WITHIN an autonomous system. Some examples of an IGP are:

- OSPF
- EIGRP
- RIP
- IS-IS

c An Exterior Gateway Protocol (EGP) would be used to exchange routing information BETWEEN autonomous systems. Some examples of an EGP are:

- Border Gateway Protocol (BGP)
- Exterior Gateway Protocol (EGP)
- Interdomain Routing Protocol (IDRP)

See figure 1 below for an example of its usage.



* Each cloud above represents an autonomous system.

SINGLE HOMED

Single homed is when a network has only one connection to a BGP peer or ISP.

Please see figure 2 on the next page for an illustration.

DUAL HOMED

Dual homed is when a network is still only connected to a single ISP or BGP peer, but now has another connection to that network. This adds redundancy to the topology.

Please see figure 2 on the next page for an illustration.

MULTI HOMED

Multi homed is where a network is connected to two or more BGP peers or ISPs. This can come in the form of Single Multihomed - where the network is connected to each BGP peer with one single connection - or Dual Multihomed - where the network is connected to each BGP peer with more than one connection.

Please see figure 2 on the next page for an illustration.

FIGURE 2

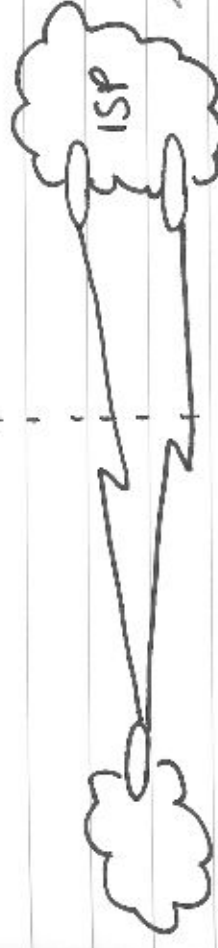
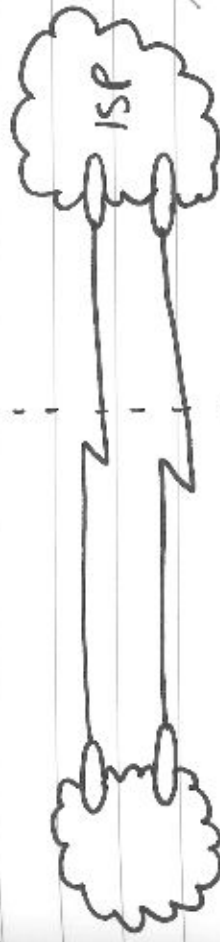
Business Enterprise

ISP

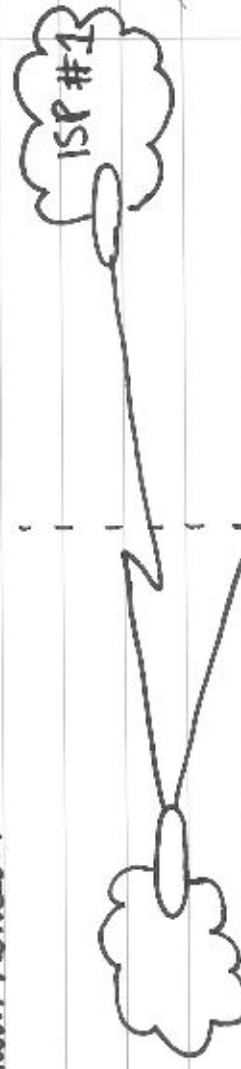
Single homed:



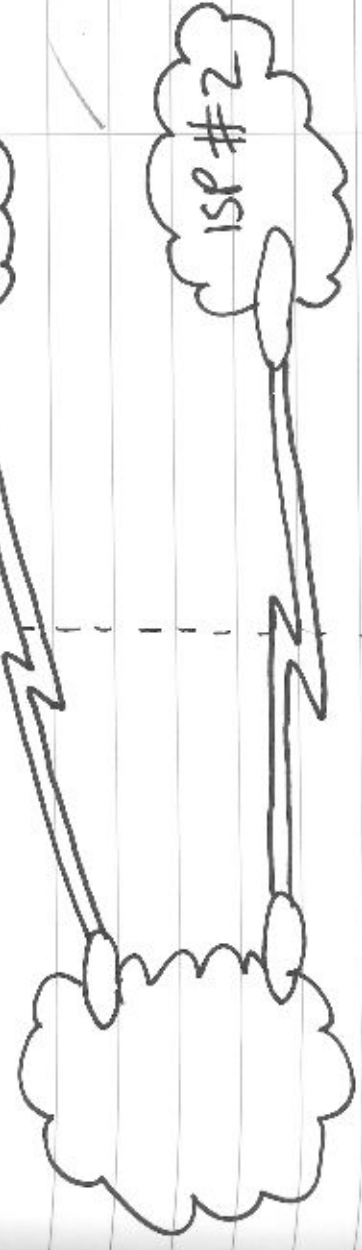
Dual homed:

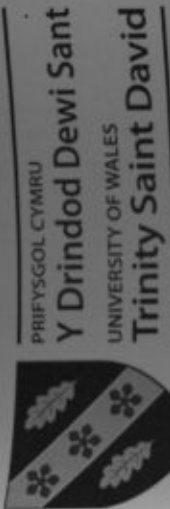


Single Multi homed:



Dual Multi homed:





Examination Answer Book

12 Pages

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1	Student Number	242060	List the numbers of the questions you have attempted	Office Use
2	Title of Examination Paper	Advanced Counting	1	94
3	Module Code	1009 (600)	2	74
4	Date and Time of Examination	10-10-2011 11:50-13:30	3	12
5	Examination Venue	249 JIS 62107	5	51
9	Seat Number		7	91
7	Number of Answer Books handed in		Total	65

(Gweler ochr arall am y fersiwn Cymraeg)



Llyfr Atebion Arholiadau

12 Tudalen

Cyfarwyddiadau i Ymgeisywyr

1. Rhwch yr holl wybodaeth y gofynnir amdani yn y blychau isod.
2. Rhwch eich enw yn y lle a ddarperir i'r dde a selwch i guddio eich enw.
3. Rhaid i'r atebion fod mewn llawysgrifen ddarllednawd. Gall yr Arholwyr naill ai anwybyddu script annarlleneddwy, neu drefnu iddi gael ei theipio a chael yr ymgeisydd i ddiu.
4. Ysgrifennwch eich atebion mewn inc.
5. Dechnewch bob ateb ar dudalen newydd. Gwnewch unrhyw fras nodiadau yn y llyfr atebion a thynnu llinell drwyddynl.
6. Ni ddylid rhwgo unrhyw ran o'r llyfr hwn; rhaid ei gyflwyno yn gyfan.
7. Os defnyddir mwy nag un llyfr, rhwymwch lwygyda'i gilydd gan ddefnyddio'r tagiau sydd ar gael oddi wrth y gwyllwrgwylwyr.
8. Rhaid dychwelyd pob llyfr. Ni chaniateir mynd â llyfrau atebion, wedi eu defnyddio neu heb eu defnyddio, allan o'r lleoliad arholi o dan unrhyw amgylchiadau.

1	Rhif Mlynyriwr	Rhestrwch rhan y cwestiynau a ymgeisydd gennyh	At Ddiweddion y Swyddfa
2	Teitl y Papur Arholiad		
3	Cod y Modwl		
4	Dyddiad ac Amser yr Arholiad		
5	Lleoliad yr Arholiad		
6	Rhif Sedd		
7	Nifer y Llyfrau Atebion a gyflwynwyd	Cyfanswm	

A wnewch chi lenwi'r rhan hon a'i SELIO cyn i'r arholiad ddechrau.

Cyfenw _____ (LLYTHRENNAU BREISION) Enw(au) cyntaf _____

OSPF Criteria

1)

Router
SPF

Is there an explicitly configured router id?



Is there an IPv4 interface configured?

Yes

Yes

Yes

Yes

use that router id

use the lowest active IP address

IPv4 address

OSPF uses Dijkstra's algorithm to find the best route (SPF). It's imperative that a router has an ID to help it communicate using OSPF which must be manually configured.

Route Summarization is used instead of advertising the network addresses the router will become Summarised to reduce overhead of the network. Routing Info can be transported through the router which have been Summarised.

- less overhead for the network.
- less resources needed.
- more efficient because the addresses are not being advertised.

A Router must have an ID to participate in the designated router election process and the ID gives authentication to the packets to travel across the network.

Static routing will generally have a pre-determined route manually configured as opposed to dynamic routing which can dynamically learn any ~~ad~~ adjacencies or destinations and changes the topology based on network modification.

Static routing

Advantages -

- Very Secure - NO advertising is involved with static routing, Making for a Secure network.
- low cost - The cost of using static routing is significantly less than dynamic because the amount of resources needed is less.
- less CPU and Memory - The network size of when using static routing will be smaller than ~~would~~ ~~generally~~ ~~be~~ a dynamic network, less CPU and Memory will be required for this reason.
- easy to implement

Disadvantages

- only suitable for small networks or means of using a specific route.
- NO Redundancy - if the route fails then human or physical intervention is needed.
- Can be time consuming in large networks to implement.

Dynamic

Advantages

- The scale of the network can be a lot larger than static because of the protocols which assist in dynamic routing.
- Dynamically learns best routes.
- Can recover from failure - Dynamic routing has redundancy, back up routes will be enabled should a line fail.
- Dynamically learns the scaling network topology or any changes made to it.
- Initially time consuming to implement but benefits long term.

Disadvantages

- Costs more due to the size of the network and the amount of resources needed.
- Needs additional memory and CPU compared to static routing.
- Not as secure as static routing because it advertises its information.
- Time consuming to configure and implement.

7

4

3

Successor → A neighbour to the router which has the lowest calculated metric.

Section B

Feasible Distance → is the metric/distance from the Successor to the destination network.

Feasible Successor → is a loop-free backup path neighbours with the lowest metric.

Reported Distance → is the metric of the neighbour Successor to the destination network.

Feasible Condition → is met when the RD of the local router is less than the FD of the Successor.

P = Passive state, The Dual algorithm has run and a Successor has been identified. (Diffusing update algorithm).

If the P was an A this would indicate that the state is ACTIVE, Active state is when the Dual algorithm is running and performing a calculation to determine and identify the Successor.

Partial State → The change or modification results in updates being sent.

Bounded - The propagation of the partial updates will be sent to the ~~end~~ only the routers affected.

An Autonomous System is a Group or collection of networks which are all managed by one entity or organisation. These could be things such as universities or public services or a business enterprise.

An Interior Gateway protocol would be used to manage the transportation of routing information within the same autonomous system. Some of these protocols include;

OSPF (Open shortest path first)
EIGRP (Extended

IS-IS

RIP Routing Internet protocol

RIPv2

An exterior Gateway protocol would be used to connect multiple autonomous systems together to pass routing information. The main protocol used to facilitate this process is BGP, Border Gateway

protocol. This will allow the autonomous systems to exchange routing information with other Autonomous systems.

- IGP - IGP?

Single homed is when an enterprise is connected to

1 ISP

Enterprise

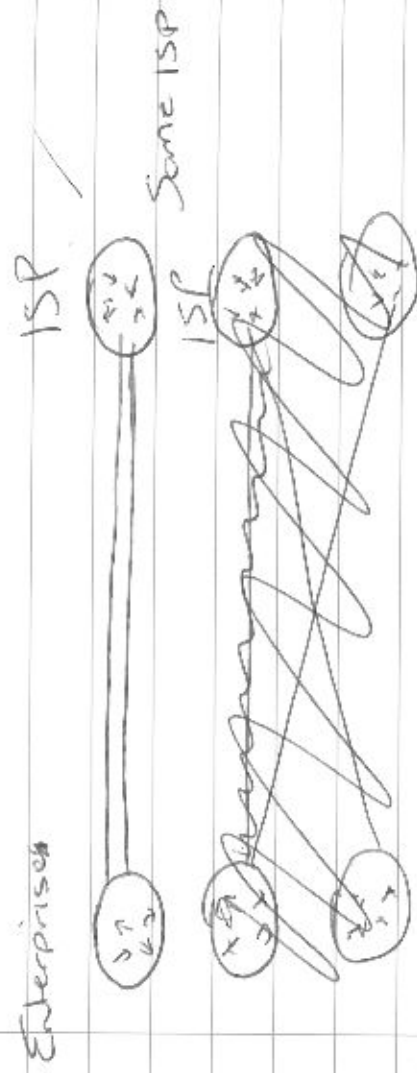
ISP



* Single homed has no redundancy measures, should the link fail then human intervention is needed.

Dual homed

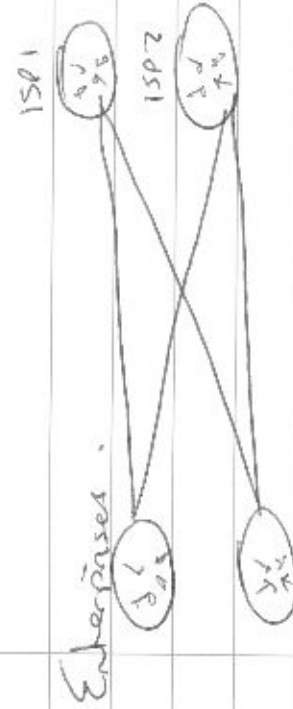
A method where an enterprise which are connected to the ISP have increased redundancy because of the amount of links they have.



Should a link/connection fail, measures are in place to ensure the stability is maintained.

Multi homed

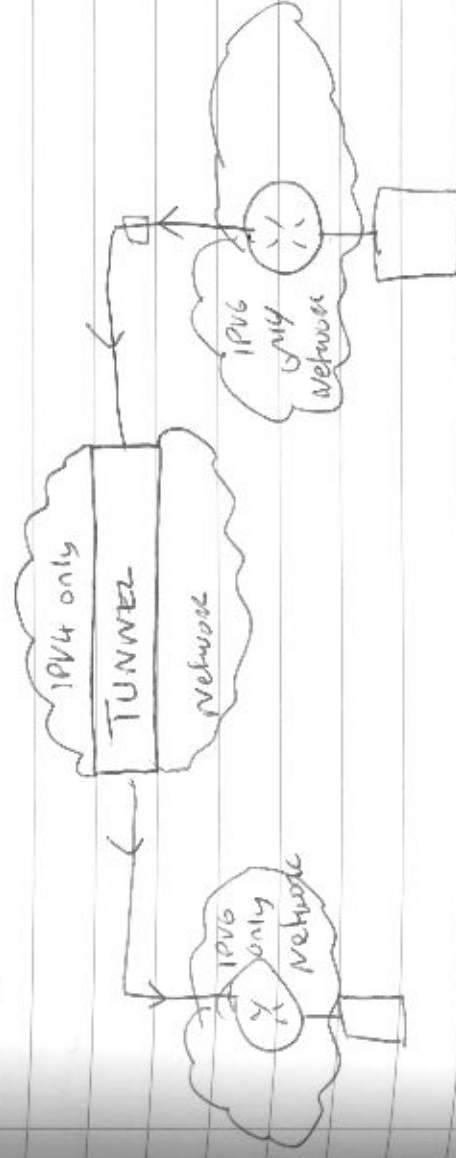
Multi homed is a method where Enterprises have connections to multiple ISPs. There are different variations of multi-homed such as single multi-homed and dual multi-homed multi-homed.



Dual stack - Allows for IPv4 and IPv6 to coexist in the same network segment. Dual stack devices run IPv4 and IPv6 protocol stack simultaneously.



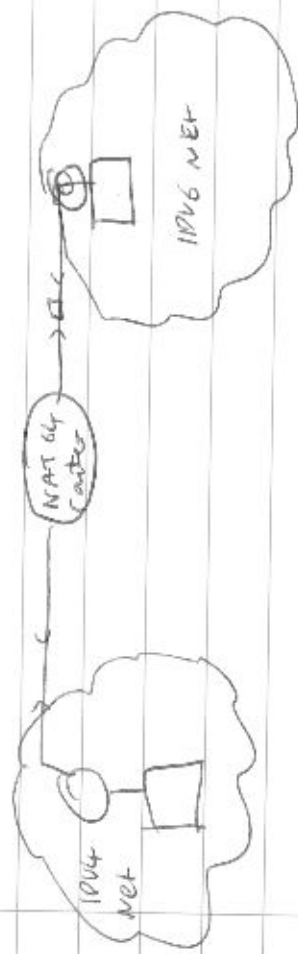
Tunnelling - is the process of transporting an IPv6 packet through an IPv4 network. The IPv6 packet becomes encapsulated in the IPv4 packet whilst in the IPv4 network.



Translation

The translation process occurs with NAT64 enabled devices (routers). These devices support the distribution and translation from IPv6 packet and/or IPv4 packet. The process is similar to the way General NAT works but facilitates multiple versions translation across the network.

NAT64
router



EUI64

Extended unique identifier generates an interface ID by using 48 bits from the client mac address.



And inserting 16 bits in the middle of the Split 48. Then the mac address is converted to binary.

mac AA:BB:CC:DD:EE:FF:GG:HHH Interface ID

Padding
01010101 01110111 0
01010101 01110111 0

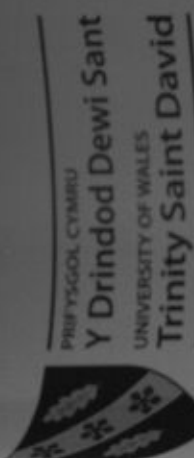
The 7th bit is swapped, which will either increment the hex value +2 or -2 (1010),



client mac address + 16 bits (FFFE).

The process of swapping the 7th bit of the mac address finally gives

The 64-bit unique identifier its interface ID.



Examination Answer Book

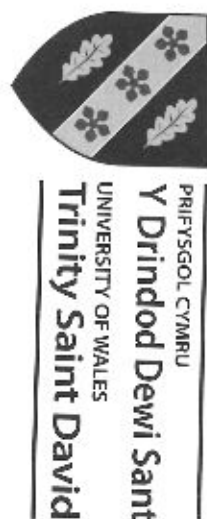
12 Pages

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1	Student Number	4472801	Office Use
2	Title of Examination Paper	Advanced Routing	A1 44
3	Module Code	CSAC 600	A2 92
4	Date and Time of Examination	05-11-2010 10:30	B3 00
5	Examination Venue	Old St. George's	B4 88
6	Seat Number		B5 11
7	Number of Answer Books handed in	1	Total 32

(Gwneithwch i'w rhoi arall am y fersiwn Cymraeg)



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A wnewch chi lenwi'r rhan hon a'i SELIO cyn i'r arholiad ddechrau.

Cyfenw _____ (LLYTHRENNAU BREISION) Enw(au) cyntaf _____

Llenwch y rhan hon, bynnwch y sgrifft, bynnwch i'r dde a selwch i guddio eich enw.

PLYGWCH

1
1/

1A) Each single OSPF router must be given an unique router id. Once given, each router is assigned with an IPv4 neighbour. It is recommended not to modify or change the router as its neighbour has already been set. ~~The OSPF router must IP~~
The three criteria that OSPF derives from the router ID is that it has no hop count limitations, no loopback and ~~it~~ has fast convergence. It is also open standard.

3
3/

B) There are many benefits to route summarisation such as it is the key to scalability; summarising a possible 30 subnets into one base route. Route summarisation ~~also~~ also saves memory and bandwidth as it is scaling a network & down. A given database will also reduce in size, providing a much more readable network. Route summarisation also solves the ~~problem~~ problem of LSA flooding and improves how a network on a large scale can function.

2a) ~~The advantages~~ There are copious amount of advantages regarding Dynamic Routing. One being able to create routes based on real time networks. This means that with Dynamic Routing protocol comes with the responsibility of creating, modifying and maintaining a network. ~~It~~ also much easier to install on larger networks as they are in a constant state of change. The DR is quite initiative

as it is able to learn from the network and suggest/take the best possible route. Due to its scalability however, dynamic routing is quite insecure as there are more ~~at~~ areas of the network available to breach. It is known to be quite costly.

Static routing is the complete opposite to dynamic routing, and in many ways. Static routing is typically controlled by one admin, as it is configured ahead of putting the network live. This allows for manual configuration along with laying out the route it will take. Due to being pre-configured, this could cause major disruption if something goes wrong on the route as there is no alternative path route like there is available with dynamic routing. However, due to its limited means, static routing is much more secure as only the admin has access and that only they may configure it.

3a) The advertised distance is the lowest metric cost between the local router and the feasible successor. The feasible successor ~~the~~ has gained the role with the lowest metric cost overall as it is the outcome. The feasible distance is the distance from the original start of the route to the successor.

3b) Protocol?

- Algorithm?

4a) The data structure components are described as:

- Adjacent will create the neighbour table. ✓
- Following will create the routing table 3
- Link State Database (LSDB) will create the protocol table. 3

There are 5 Routing Protocol Messages;

- Hello packet ✓
- Request packet ✓
- Update packet ✓
- Query packet ✗
- Ack (acknowledge) packet ✓

The OSPF algorithm follows the STP protocol algorithm by ~~talkstar~~ ^{Kalkstar}? which uses the CPU in order to communicate.

4b) The difference between Single Area and

Multiarea OSPF are as shown and discussed below. Single Area OSPF is a single one connected to a singuladr, individual, IPs. It has only one connection meaning that there is a one way route - this is problematic if an error occurs as the whole network would stop working.

Multiple allows for multiple numbers of connections.

5a) An autonomous system is a prefixed protocol used within a one entity network / database.

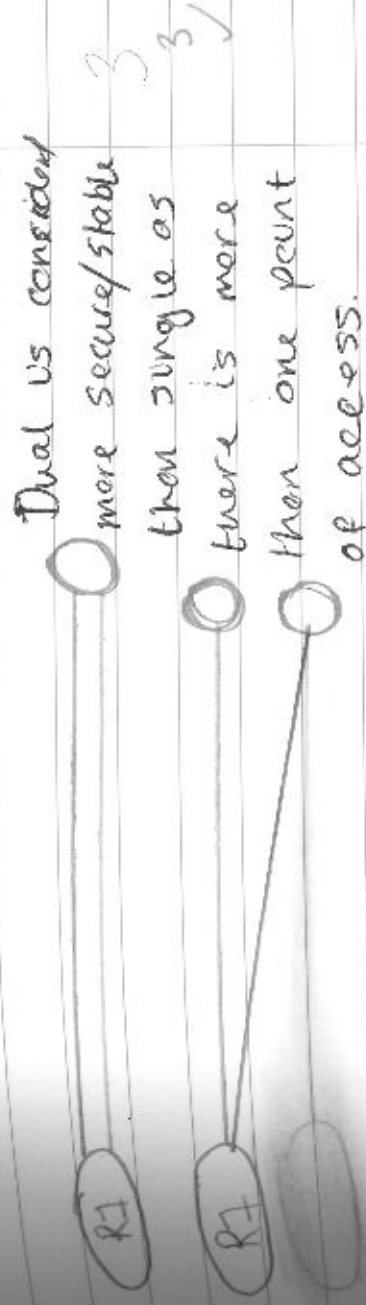
b) An IGP would more likely be used in a small home / ^{office} business environment as the network is interior, all info information on the network would be sent / displayed in house / internally, or within that environment.

c) An EGP would be used in a large business / campus environment as the information gathered internally is then allowed to be communicated between different subparts of the campus / business, through the Internet.

d) Single homed is a singular connection between a router a ISP / IP.

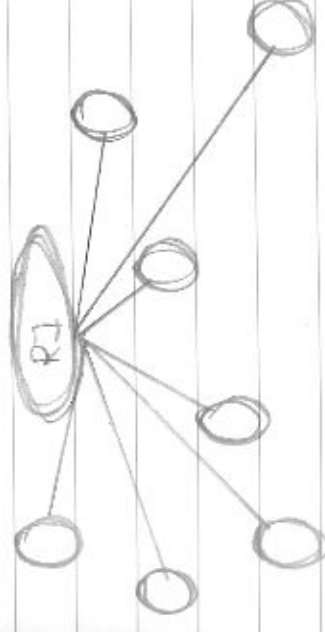


Dual homed is two connections from a router to an ISP / IP. Or it could be one connection from ~~one~~ routers to two ISP / IPs.

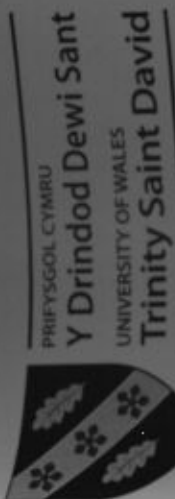


Thus if a problem occurred then there would be access to an alternative route unlike problematic single homed.

Multi-homed allows for multiple connections within the network.



This is beneficial as there are more than one routes thus this is the most stable out of the three.



Examination Answer Book

12 Pages

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1	Student Number	RD069008	List the numbers of the questions you have attempted	Office Use
2	Title of Examination Paper	Advanced Accounting	1	33
3	Module Code	CSACC001	2	77
4	Date and Time of Examination	10/10/18 08:11	5	32
5	Examination Venue	Collegesgar	6	66
9	Seat Number		7	13
7	Number of Answer Books handed in		Total	32

(Gweler yr ochr arall am y fersiwn Cymraeg)



Llyfr Atebion Arholiadau

12 Tudalen

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A wnewch chi lenwi'r rhan hon a'i SELIO cyn i'r arholiad ddechrau.

Cyfenw _____ (LLYTHRENNAU BREISION) Enw(au) cyntaf _____

Section A

Question 1

A) Three criteria that OSPF derives its router ID are.

1) highest IP address on a physical interface will be used. 1/

2) if Loopback interface has been configured then the highest IP will be taken.

B) The benefit of route summarisation are;

1) Saves CPU power ✓

2) Saves Bandwidth ✓

3) Controls complex networks into one line. 2/

4)

Question 2

Advantages of Static.

1) Full admin Control.

2) less CPU overhead. ✓

3) Not complex design.

4) Fast Bandwidth.

Disadvantages of Static.

1) ~~Overwhelming Admin~~

- 1) Only designed for small networks.
- 2) A change would need admin to change every part of the interconnect devices configurations to suit.

Advantages of dynamic routing

- 1) Less Admin work.
- 2) Scalable for enterprise deployment, big networks.
- 3) Algorithms to make routing faster.

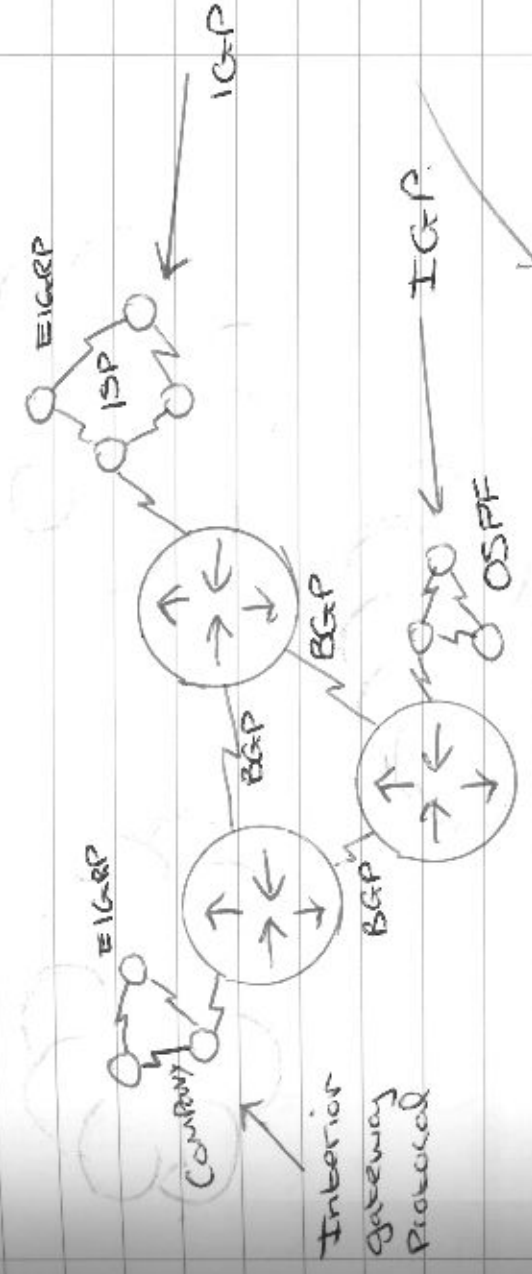
Disadvantages of dynamic routing

- 1) More CPU usage.
- 2) Complex designs.
- 3)

Section B

Question 3 of Section B

- 5) Autonomous Systems are a grouping of directly connected ~~peer~~ interior gateway protocols that are connected via Exterior gateway protocol.



- B) Interior gateway protocol would be used in with.

- 1) EIGRP (Enhance Interior Gateway Protocol).
- 2) OSPF (Open Shortest Path First).
- 3) RIP
- 4) Static.

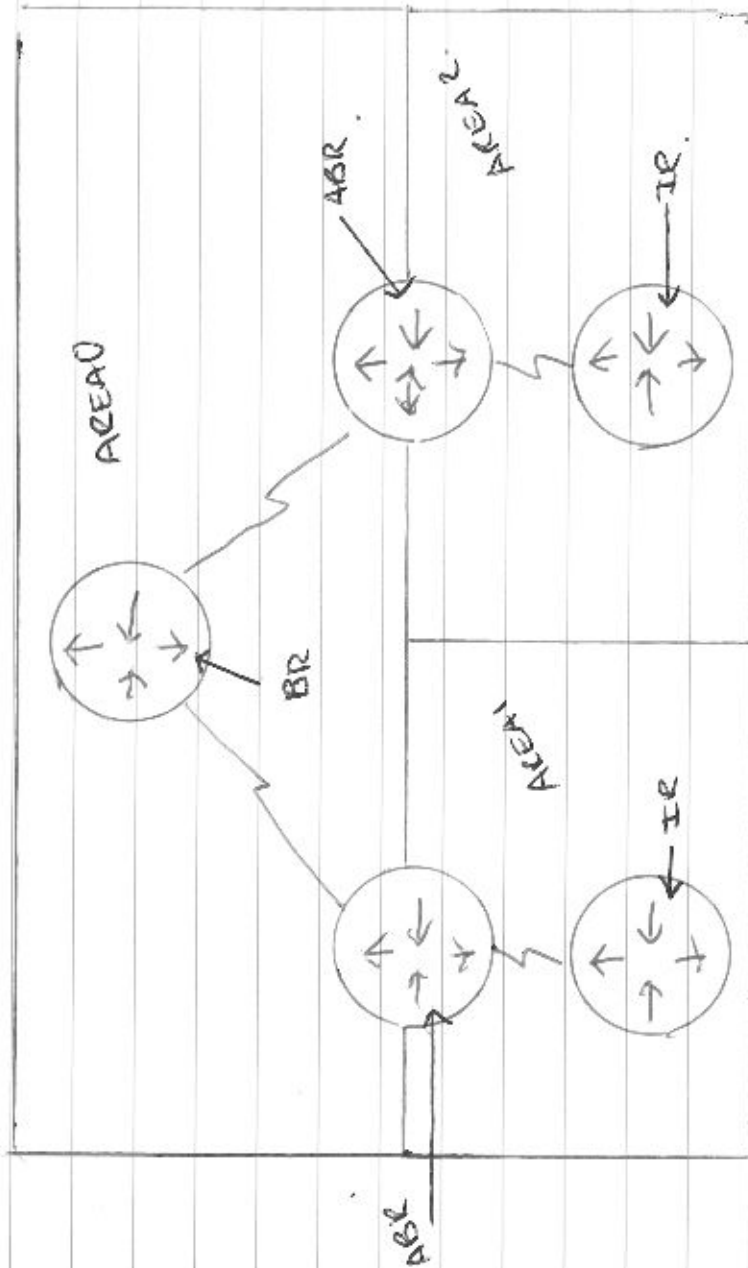
- c) Gate Exterior gateway protocol would be used with Border gateway protocol, it is currently the only one in use, that is used to connect all Interior gateway protocols, this would be known as backbone.

D)

Question 6

A) Open Shortest path first Transit, is when all data from internal router are router before reaching there destination all ~~route~~ data then must be routed through the backbone first.

B)



IR = Internal Router

BR = Backbone router

ABR = Area Border Router

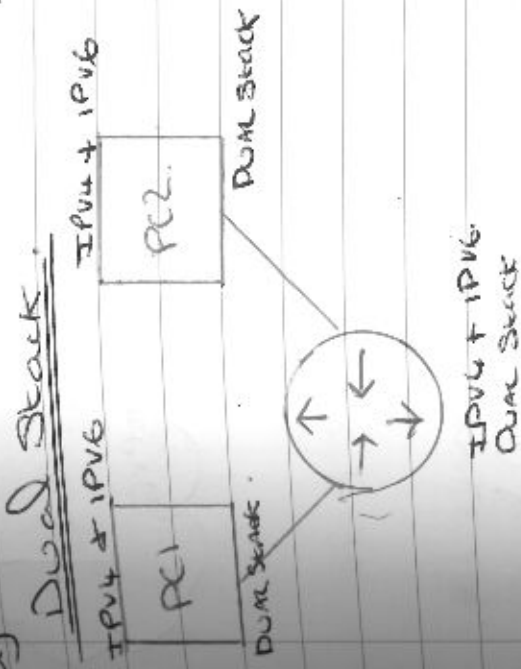
4

4

4

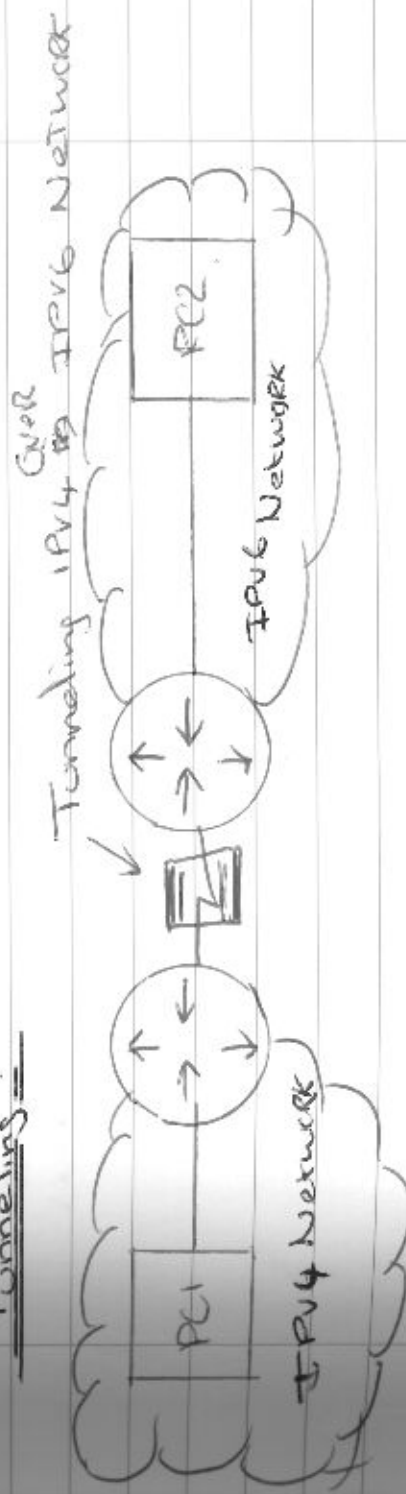
7)

a)



As shown above dual stack is devices help IPv4 and IPv6 Coexist together in the same network.

Tunneling

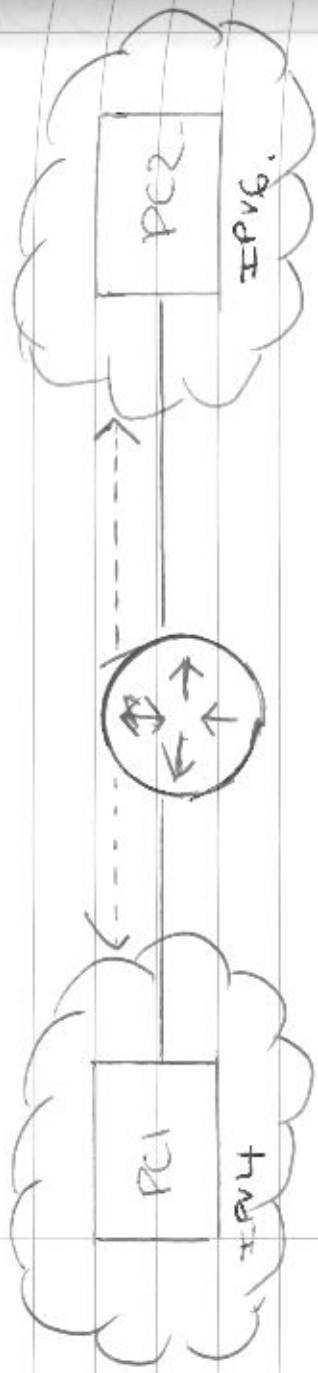


As shown above within a IPv6 network if a IPv4 packet was sent, it would be tunneled between the network.

4

4

Translation:



As shown above, Translation is when IPv4, PC1 needs to communicate with PC2 but PC2 is on a IPv6 network. So Network ~~Router~~ would Translate IPv4 to IPv6 and vice versa.

B) Extended Unique Identifier generates an interface ID in three steps as follows.

1) Split the IPv6 address as follows

AA.BB.CC.DD.EE.FF

2) Bridge the Split as follows

AA.BB.CC.FFEE.DD.EE.FF

3) Flip the first octet as follows by changing it to its Binary format.

AA

10101010

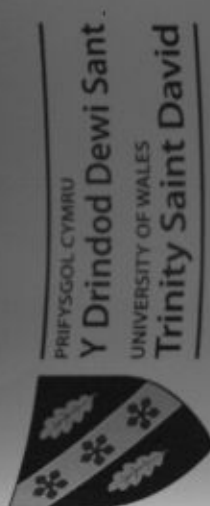
3) Once the Bridge has been added the IPv6 will need to be fixed. This is done by getting the Binary value first. The flipping its Seven value, as follows.

Seven value.

IPv6 → AA
Binary → 10101010

IPv6 → AA
Binary → 10101010

10 → 1000



Examination Answer Book

12 Pages

Instructions to candidates

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right and seal to hide your name.
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.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.

1	Student Number	023872	List the numbers of the questions you have attempted	Office Use
2	Title of Examination Paper	Advanced Accounting	1	77
3	Module Code	CSA6600	2	69
4	Date and Time of Examination	10/02/2011 08.00-10.30	3	88
5	Examination Venue	Cardiff Business School	4	1221
6	Seat Number		5	1151
7	Number of Answer Books handed in		Total	87

(Gweler yr ochr arall am y ferision Cymraeg)



Llyfr Atebion Arholiadau

12 Tudalen

Cyfarwyddiadau i Ymgeiswyr

1. Rhwng yr holl wybodaeth y gofynnir amdani yn y blychau isod.
2. Rhwng eich enw yn y lle a ddarperir i'r dde a seilwch i guddio eich enw.
3. Rhaid i'r atebion fod mewn llawysgrifen ddarlennadwy. Gall yr Arholwyr naill ai anwybyddu script amarlennadwy, neu drefnu iddi gael ei theipio a chael yr ymgeisydd i dalu.
4. Ysgrifennwch eich atebion mewn inc.
5. Dechreuwch bob ateb ar dudalen newydd. Gwnewch unrhyw fras nodiadau yn y llyfr atebion a thynnu llinell drwyddylt.
6. Ni ddylid rhwygo unrhyw ran o'r llyfr hwn; rhaid ei gyflwyno yn gyfan.
7. Os defnyddir mwy nag un llyfr, rhwymwch hwy gyda i gilydd gan ddefnyddio'r tagiau sydd ar gael oddi wrth y gwylwr/gwylwyr.
8. Rhaid dychwelyd pob llyfr. Ni chaniateir mynd â llyfrau atebion, wedi eu defnyddio neu heb eu defnyddio, allan o'r lleoliad arholi o dan unrhyw amgylchiadau.

1	Rhif Myfyrwr	Rheswch rhifau'r cwestiynau a ymgeisiwyd gennych	At Ddiwedd y Swyddfa
2	Teitl y Papur Arholiad		
3	Cod y Modwl		
4	Dyddiad ac Amser yr Arholiad		
5	Lleoliad yr Arholiad		
6	Rhif Sedd		
7	Nifer y Llyfrau Atebion a gyflwynwyd	Cyfanswm	

A wnewch chi lenwi'r rhan hon a'i SELIO cyn i'r arholiad ddechrau.

Cyfenw _____ (LLYTHRENNAU BREISION) Enw(au) cyntaf _____

Section A

1. Router ID needs to be unique to the router.

The 3 criteria are

1. ~~Router~~ manually configuration of the router ~~as highest router with~~ ✓
2. Router with the highest loopback address interface ✓
3. Router with the highest non loopback address interface ✓

6

6

Route Summarization

Route Summarization benefits is that

it helps with 2 problems like

- Large Topology Tables
- LSA Flooding on the Autonomous System

Route Summarization helps the scalability of the

network, when one router goes down

all other routers are involved calculating

the shortest path first. Route Summarization

doesn't need to recalc the shortest path

algorithm preventing ~~continuous~~ flooding in

network. This helps the scalability of the

network.

2.

Static Routing entries need to be configured manually by the administrator. Routers IDs need to be entered by the administrator, if any router disappears the administrator needs to make the change manually. Updates to the topology table also need to be updated by the administrator. Static Routing has ~~low~~ less processing so is cost effective (compared to run). But more work is needed to be done manually.

Dynamic Routing

Dynamic Routing entries are ~~not~~ automated by algorithms. Algorithms that are used are Link State and Distance Vector.

~~When a link goes down~~ if a router goes down

Dynamic Routing will update. Periodically changes will be made to the network. Updates will

be made to the network and ~~the~~ the

topology table by dynamic routing.

A lot more processing is used so it is more costly to run.

3. Successor -

Successor is a metric used to calculate the best distance to a destination

Feasible Distance (FD)

Feasible Distance is where a metric is used to calculate the best distance to a network

Feasible Successor

This is where if the

Successor went down the Feasible

Successor will be its backup. Feasible

Successor will kick in straight away.

Reported Distance

This is where a reported distance of the neighbouring Routers metric is taken place

Feasible Condition

This is where the metric can not be higher than the Reported Distance

0-5

b 8 stands for Passive

A stands for Active

4

DATA STRUCTURES

Has 3 TABLES

Adjacency Table - Neighbor Table

Link State Table - Topology Table

Forwarding Table - Routing Table

These tables hold information on

neighboring Routers and information on any

communication between Routers.

Routing Protocol messages

OSPF uses to communicate with other

Routers on

Hello

Database

Request Packet

Update Packets

Acknowledgement Packets

Algorithm

The algorithm OSPF uses is

Dijkstra SPF algorithm. The SPF algorithm

uses the shortest path first. The SPF algorithm

uses a tree method where it forms a root

and chooses the next shortest path to the

next node.

Single area you are just doing the one area

where a multiarea there are several areas in

the network

Area 0

Area 1

Area 2

So a Autonomous System is where a group of routers are grouped together on a network like an organisation of company. ~~Each router~~ Each router on an autonomous system needs its own autonomous number.

3 3 3

1 An ISP would be used ~~in an~~ autonomous system. Examples of an ISP are EIGRP OSPF ISIS

2 2

2 An EGP would be for the autonomous systems to communicate with each other. Border Gateway Protocol is the only official EGP on the internet.

Single homed

Enterprise

ISP



3 where there is only one ISP and one router connected. There is no need for a BGP for this. There is no redundancy which can be a problem.

Dual Homed

Enterprise

ISP



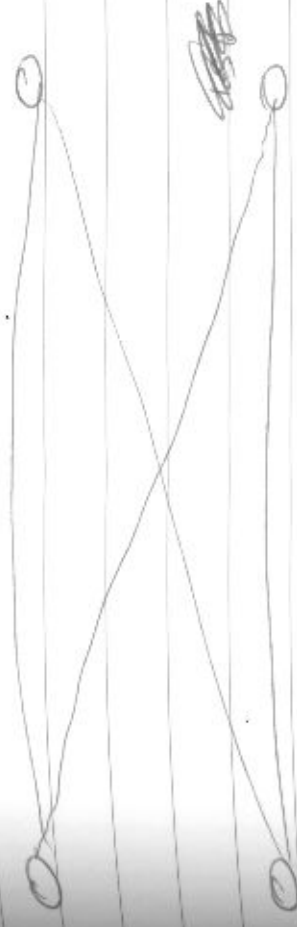
2 2

3 Another link has been added therefore making the network with redundancy. If one router goes down, the other will be used.

Multi Homed

Enterprise

ISP



2 Another link has been added therefore making this the highest redundant by the most costly. If a link goes down another router can be used as back up.