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INTERNET PROTOCOLS

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Objectives:

The aim of this paper is to give students the fundamental information and systems that support and improve the learning procedure. Will be urged to build up a positive and intelligent way to deal with learning, and to assume liability for their very own learning. Such abilities advance a more profound comprehension of the subjects examined all through the higher instruction program. They bolster feasible long-lasting learning, and are the transferable aptitudes wanted in the business setting.

Finding:

Upon the fruitful consummation of this module, the student ought to have the option to exhibit the capacity to Demonstrate an information and comprehension of Internet Protocol and to structure an IP tending to conspire utilizing IPv4/6, subnetting and VLSM.

Key words:

IPv4 addressing, Class A, B, C and D IP addressing, Public and Private IP addressing, Subnetting IP networks, variable length subnet mask, Unicast, multicast, and broadcast with IPv4, IPv6 addressing

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I. Part 1 Research report of IPv6 addressing

1.Introduction IPv6 and IPv4

There is a Contrast Between IPv4 and IPv6 Addresses.

They are both IP addresses and binary numbers. IPv4 is 32 piece parallel number while IPv6 is 128 piece double number location. This address are isolated by periods while IPv6 address are isolated by colons. (UWTSD) Both are utilized to distinguish machines associated with a system. On a basic level, they are the equivalent, however they are distinctive by the way they work. The key differences are:

“IPv4 is a numeric addressing method whereas IPv6 is an alphanumeric addressing method. IPv4 binary bits are separated by a dot(.) whereas IPv6 binary bits are separated by a colon (:). IPv4 offers 12 header fields whereas IPv6 offers 8 header fields. IPv4 supports broadcast whereas IPv6 doesn't support broadcast. IPv4 has checksum fields while IPv6 doesn't have checksum fields IPv4 supports VLSM (Virtual Length Subnet Mask) whereas IPv6 doesn't support VLSM. IPv4 uses ARP (Address Resolution Protocol) to map to MAC address whereas IPv6 uses NDP (Neighbour Discovery Protocol) to map to MAC address. “(Guru 99. com) [1]

2.IPv6

2.1. Representation

In any case, after innumerable declarations that the IPv4 sky is inappropriate, an IPv6 has been developed. Later is presently empowered as a matter of course on each significant host working framework, including, macOS, Linux and Windows. All versatile working frameworks are likewise IPv6-empowered, including Android, iOS, and Windows. On account of the gigantic number of cell phones, the versatile transporters are driving the route in IPv6 arrangements. For instance, World IPv6 Launch estimations demonstrated that over 75% of Verizon Wireless' general traffic is over IPv6. T-Mobile's telephones are IPv6-just; they utilize an uncommon convention interpretation procedure when imparting. PlayStation are likewise IPv6-empowered. IPv6 is here. (Rick Graziani, 2017)

2.2Composition

IPv6 utilizes phrasing and terms that are used in IPv4. Coming up next are a couple of terms it is good to acknowledge and remember Prefix is the system part of an IPv6 address. In an IPv4 address, we call this the network portion of the location, or the network prefix. Prefix length: The prefix length is the quantity of generally huge or furthest left bits that characterize the prefix. This is identical to the subnet veil in IPv4. In IPv6 the prefix length can be/0 to/128. The Interface ID is proportional to the host part of an IPv4 address. IPv6 utilizes the term Interface ID on the grounds that any sort of gadget can have an IP address, not only a host PC. A gadget with an IPv6 interface may run anyplace from a typical server or customer PC to a coffee machine or biomedical sensor. The term interface is utilized in light of the fact that an IP address (IPv4 or IPv6) is appointed to an interface, and a gadget may have numerous interfaces. Device or node: An IPv6 hub or gadget is whatever can have an IPv6 address, including customary gadgets, for example, PCs and printers, alongside different sorts of gadgets, for example, webcams, installed gadgets, and Internet of Things (IoT) gadgets. (Rick Graziani, 2017)

3. IPv6 addressing

3.1. The 3 types of IPv6 addresses

The three sorts of IPv6 addresses are: unicast, anycast, and multicast. The first one recognizes a solitary interface. Anycast addresses recognize a lot of interfaces so that a parcel sent to an anycast address is conveyed to an individual from the set. And the last one recognizes a gathering so that a bundle sent to a multicast address is conveyed to the entirety of the interfaces in the gathering. Broadband is no more used in IPv6, multicast addresses dominated. (Oracle.com, 2010).

3.1.1. Unicast Address

The most used sorts are worldwide unicast addresses, which are proportional to IPv4 open locations, and to the local areas. A unicast address recognizes an interface on an IPv6 gadget. A parcel sent to unicast address is gotten by the interface that is doled out to that address. Like IPv4, a source

IPv6 addresses must be a unicast address. Here I am writing all the different unicast addressees: Global unicast is routable location in the IPv6 Internet, like an open IPv4 address; Link-localis is used distinctly to speak with gadgets on the very same (lokalis-lokal) link; Loopback isn't appointed to any physical interface that can be utilized for a host to send an IPv6 parcel to itself. Undefined location is Used distinctly as a source address and shows the nonappearance of an IPv6 address; Unique local is equal to a private location in IPv4 (RFC 1918) and not expected to be routable in the IPv6 Internet. Not at all like RFC 1918 locations, these addresses are not expected to be worldwide unicast address. IPv4 implanted is an IPv6 address that conveys an IPv4 address in the low-request 32 bits of the location. (Rick Graziani, 2017)

3.1.2. Multicast address

Multicast addresses is a method where a gadget sends a solitary parcel to numerous addresses at the very same time, whereas unicast address sends a solitary parcel to a single. Multiple goals can really be various interfaces on a similar gadget, yet they are normally various gadgets. Every unicast address assigned to an interface also has an associated solicited-node multicast address. IPv6's solicited-node address provides a more efficient solution than a broadcast address. The multicast address is mapped to an Ethernet MAC address, which allows NICs to filter whether to accept the frames. (Rick Graziani, 2017)

3.1.3. Anycast Address

An anycast address is a location that is doled out to interfaces that normally have a place with various hubs. A parcel sent to an anycast address is conveyed to the nearest interface recognized by the anycast address. They are very similar to unicast addresses. This is because the later addresses are dispensed from the unicast address space. Appointing unicast address to more than one interface makes a unicast an anycast address. Hubs to which the later is doled out must be unequivocally designed to perceive that the location is an anycast address. (sisco.com, 2012)

4. Security

IPv6 is the newest form that is utilized for correspondences on the Internet. It has been in presence for a long time. Be that as it may, as of now

numerous associations have understood that they can't convey IPv6 without thinking about the security of this convention. IPv6 security vulnerabilities presently exist, and as the ubiquity of the IPv6 increments, so do the quantity of dangers. IP security (IPsec) is accessible with IPv6. IPv6 headers have no security components themselves, the same as in IPv4. Executives depend on the IPsec convention suite for security. Similar security dangers for man-in-the-centre assaults in Internet Key Exchange, in IPv4 are available in IPv6. At the point when you consider the ways that an IPv4 or IPv6 system can be undermined, there are numerous variants. Assaults against systems ordinarily can be categorized as one of the accompanying normal assaults: Internet, Sniffing, header control, session. As we can see above, it is significant to take a notice that IPv6 isn't really more verify than IPv4. At long last, numerous of organizations are performing broad testing of IPv6, so they ideally can discover a considerable lot of the issues before the time has come to convey IPv6. In any case, all the significant sellers of IT gear and programming have distributed vulnerabilities in their IPv6 executions, all of them have distributed vulnerabilities in their product. As IPv6 has been embraced, it is obvious that these significant merchants have drawn the consideration of the programmers. (UWTSD, 2019)

5. Conclusion

Conveying IPv6 is a broad theme and, contingent upon your system and your very own needs, it can mean a wide range of things. Definitely we need to consider first IPv6 address plan, then Configuring IPv6 VLANs and Choosing a first-hop redundancy protocol for IPv6 Dual stack; DNS for IPv6; ACLs; Translation protocols and tunnelling. (Rick Graziani, 2017)

Here is no question that, before conveying IPv6 you ought to know about the accompanying parts of security for IPv6 traffic: Protection from scanning and attacking; IPv6 packets protection; Controlling and guarding of what traffic is traded with the Internet; Authorization for randomly doled out addresses and configurations; Prevention frameworks (Firewalls and interruption discovery). (UWTSD, 2019)

I can't resist mentioning that a fascinating business opportunity exists, given the current IPv4 advertise, to convey IPv6 innovation and afterward sell an organization's IPv4 address space to pay for the transformation. In such manner, the IPv4 space is a theoretical resource; as the transformation advances, no doubt the estimation of an IPv4 address will rot after some time. For Example, Google, LinkedIn, Facebook and Akamai are effectively starting IPv6 inside their systems and interfacing with IPv6 clients outside. An intriguing

point is that they report that conveying their administrations utilizing IPv6 seems to improve client involvement with terms of download times. IPv6-just datacentres are diminishing operational unpredictability for these exceptionally huge specialist organizations. (internet society.org, 2018)

References:

(Guru 99. com, 2019) [1]<https://www.guru99.com/difference-ipv4-vs-ipv6.html>

(Rick Graziani, 2017) **IPv6 Fundamentals: A Straightforward Approach to Understanding IPv6, Second Edition** Rick Graziani, Copyright © 2017 Cisco Systems, Inc. Cisco Press logo is a trademark of Cisco Systems, Inc.

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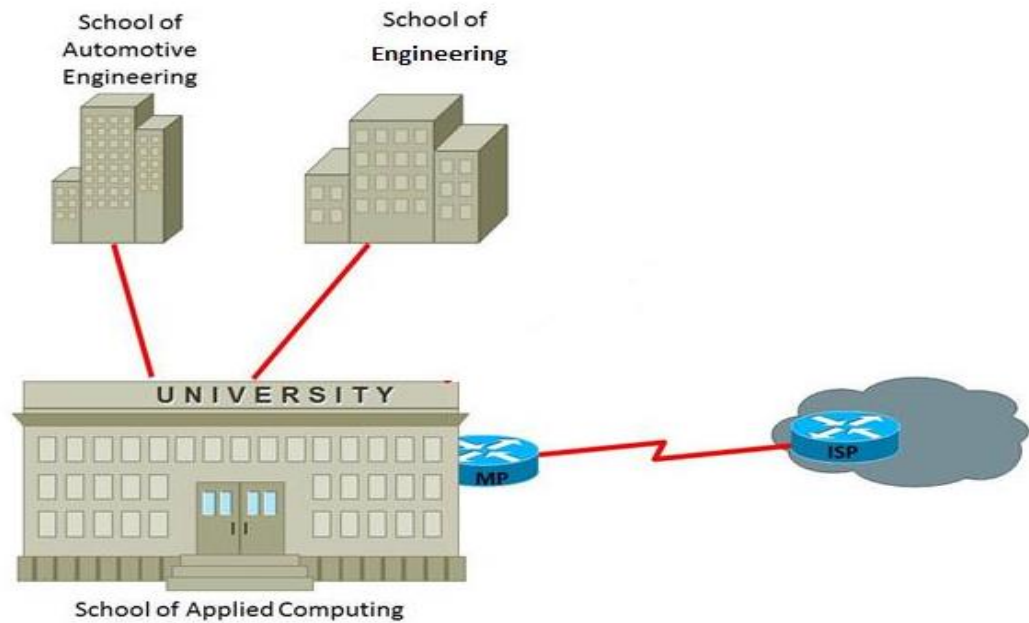
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(UWTSD, 2019) University of Welsh Trinity Saint David, 2019 Moodle academic and employability skills

II. Design an IP addressing scheme for School of Management and Engineering

IP ADDRESSING INSTRUCTIONS



IP addressing scheme :

Assigning the relative IPv6 address for 6 servers located at the University. The servers are DNS, Email, Finance, Registry, File server and a Print server. Assign appropriate IPv6 address for the link between MP and ISP.

IPv6 SERVERS

Server	IPv6
MP	::ffff:b22a.05e1
DNS	::ffff:b22a.05e2
File	::ffff:b22a.05e2

Registry	::ffff:b22a.05e2
Email	::ffff:b22a.05e2
Print	::ffff:b22a.05e2
Finance	::ffff:b22a.05e2

IP ADDRESSING SCHEME

I am choosing the next address 178.42.0.0/22. This will be enough to suit a little more than 2000 hosts-2048. The entire 178.42.0.0/24 will be assigned to the Open Access lab with 245 PCs and 5 printers, and we will have 4 free hosting for the future. 178.42.1.0/24 will be doled out for Lab308 — 140 PCs. Lab301 — 60 PCs, Lab304 —45 PCs, 303-36pcs and Lab306 — 40 PCs will be accommodated from the 178.42.2.0/26 and subnets. ADR 178.42.3.0/ will be subnet on 8 equal subnets when 1 of the 8th parts will remain empty. This one we can use to assign the servers. Only for the School of Automotive Engineering will remain 178.42.4.0/ when subneted on four masks. The next t one is 178.42.5.0/, which I am subnetting on 4. One will be doled out to Lab301 — 50 pcs, when all the rest will become 6×32 bits. The next 178.42.6.0 will be subnet on 2×128. When The first will be used for room 409 and the second is subneted on two for room 410 and 404

School of Applied Computing - Network Address: 178.42.0.0/22					
Room	Subnet mask	Network Address	First Host	Last Host	Broadcast
OA - 250 devices	255.255.255.0	178.42.0.0/24	178.42.0.1	178.42.0.254	178.42.0.255
TC - 22 devices	255.255.255.1	178.42.3.64/27	178.42.3.65	178.42.3.94	178.42.3.95
lab301 – 60 pcs	255.255.255.2	178.42.2.0/26	178.42.2.1	178.42.2.62	178.42.2.63
Lab302 – 30 pcs	255.255.255.3	178.42.3.96/27	178.42.3.97	178.42.3.126	178.42.3.127
Lab303 – 36 pcs	255.255.255.4	178.42.2.64/26	178.42.2.65	178.42.2.126	178.42.2.127
Lab304 – 45 pcs	255.255.255.5	178.42.2.128/26	178.42.2.129	178.42.2.190	178.42.2.191
Lab306 – 40 pcs	255.255.255.6	178.42.2.192/26	178.42.2.193	178.42.2.254	178.42.2.255
Lab308 – 140 pcs	255.255.255.7	178.42.1.0/24	178.42.1.1	178.42.1.254	178.42.1.255
Lab309 – 50 pcs	255.255.255.8	178.42.3.0/26	178.42.3.1	178.42.3.62	178.42.3.63
Lab310 – 18 pcs	255.255.255.9	178.42.3.128/27	178.42.3.129	178.42.3.158	178.42.3.159
Staff - 20 pcs	255.255.255.10	178.42.3.160/27	178.42.3.161	178.42.3.190	178.42.3.191
School of Automotive Engineering - Network Address: 178.42.4.0/23					

Room	Subnet mask	Network Address	First Host	Last Host	Broadcast
Lab101 – 40 pcs	255.255.255.192	178.42.4.0/26	178.42.4.1	178.42.4.62	178.42.4.63
Lab102 – 25 pcs	255.255.255.224	178.42.5.64/27	178.42.5.65	178.42.5.94	178.42.5.95
Lab103 – 35 pcs	255.255.255.192	178.42.4.64/26	178.42.4.65	178.42.4.126	178.42.4.127
Lab205 – 40 pcs	255.255.255.192	178.42.4.128/26	178.42.4.129	178.42.4.190	178.42.4.191
Lab206 – 48 pcs	255.255.255.192	178.42.4.192/26	178.42.4.193	178.42.4.254	178.42.4.255
Lab301 – 50 pcs	255.255.255.192	178.42.5.0/26	178.42.5.1	178.42.5.62	178.42.5.63
CADlab – 20 pcs	255.255.255.224	178.42.5.96/27	178.42.5.97	178.42.5.126	178.42.5.127
Staff – 25 pcs	255.255.255.224	178.42.3.192/27	178.42.3.193	178.42.3.222	178.42.3.223
School of Engineering - Network Address: 178.42.6.0/23					
Room	Subnet mask	Network Address	First Host	Last Host	Broadcast
Lab201 – 20 pcs	255.255.255.224	178.42.5.128/27	178.42.5.129	178.42.5.158	178.42.5.159
Lab202 – 80 pcs	255.255.255.128	178.42.6.0/25	178.42.6.1	178.42.6.126	178.42.6.127
Lab203 – 65 pcs	255.255.255.128	178.42.6.128/25	178.42.6.129	178.42.6.254	178.42.6.255
Lab205 – 25 pcs	255.255.255.224	178.42.5.160/27	178.42.5.161	178.42.5.190	178.42.5.191
Lab404 – 45 pcs	255.255.255.192	178.42.7.128/26	178.42.7.129	178.42.7.190	178.42.7.191
Lab408 – 28 pcs	255.255.255.224	178.42.5.192/27	178.42.5.193	178.42.5.222	178.42.5.223
Lab409 – 80 pcs	255.255.255.128	178.42.7.0/25	178.42.7.1	178.42.7.126	178.42.7.127
Lab410 – 45 pcs	255.255.255.192	178.42.7.192/26	178.42.7.193	178.42.7.254	178.42.7.255
Staff – 18 pcs	255.255.255.224	178.42.3.224/27	178.42.3.225	178.42.3.254	178.42.3.255