Task-1

Introduction: This Clinic network system used a token ring network technology. When any big data transfer one computer to another computer Ethernet network technology is so fast and secured network technology. Ethernet network technology setup needs to structure cabling. Wi-Fi network technology can be used on this Ethernet networking technology.

Network Difference: There are some difference in Ethernet, Token Ring and Wi-Fi. These differences are classified in Ethernet, Token Ring and Wi-Fi network technology.

Ethernet: This network is local area network technology. It's used TCP/IP protocol. Ethernet defines two units of transmission protocol. These are packet and frame. The OSI network protocol model it touches physical and data link layer. Ethernet standard version is IEEE 802.3 series (techtarget, 2000).

Token Ring: It's the second most widely used protocol on local area networks after Ethernet. Token ring protocol standard version specified as IEEE 802.5 series. This technology data transfer rates either 4 or 16 megabits per second very briefly. It's look like a ring or star topology (networkworld, 1994).

Wi-Fi: Wireless networking technology based on IEEE 802.11 series. The Wi-Fi alliance examples of Wi-Fi standards in chronological order include: 802.11a, 802.11b, 802.11g, 802.11n, 802.11ac. Wi-Fi chips find and connect to wireless routers when the Wi-Fi certified is match access point with vice-versa (sharpened Production, 2016).

Topology difference: A Network topology has two types. These are physical and logical topology. Three type of network topology used these are Bus, Star, Ring topology besides these

topology has some variation this are Extended Star, Mesh, star combination with bus (Studytonight, 2016). Bus topology is a series of computer connected together in one single cable if this cable backbone broke their network is broke or disconnected. Star topology connected a network group of central point a hub if this hub has troubleshoot problem the whole system fails. Ring topology computer connected by a circle or loop besides this topology has no start or end. These signal start in one direction. Now a days modern ring topology use smart hubs if any network connect to fail it removes automatically (Whatis, 1999).

Data Rate: Data rate is meant by data transfer rate in one computer to another computer. This rate is typically measured in some byte based units system these are tbps, gbps, mbps, kbps and bps. Ethernet data transfers can ten megabyte per second (Techtarget, 2008).

Required Cable: Unshielded twisted pair (UTP) cable category 6 is required in this networking process. UTP cable is using a Wi-Fi internet access in their patients own devices and connected all of PCs (Belden, 2016).

Recommendation: In this circumstance, OSI network architecture is the best and secure network technology. Local Area Network system (LAN) used in Ethernet network technology with extends star topology. This topology with create a Wi-Fi networking system besides LAN system converted to easily create virtual LANs and wireless LANs or Wi-Fi network technology system. UTP cable cat6 is the best cable in Ethernet network technology. So, Ethernet technology is the best network technology.

B) Network Architecture in OSI 7 Layer Model: This network processes open systems interconnect (OSI) network layer data transfer and receive on seven steps this all of steps has

different type of protocols and layer. Physical layer is the lowest and Application layer is the heights layer in OSI seven layers model.

Physical Layer: This layer connected with transmission and reception of the unstructured raw bit stream over a physical medium. It provides data encoding, attachment and accommodating possibility, transmission technique in physical medium transmission in bit and frame synchronization (Highteck, 2016).

Data Link Layer: This layer provides error free transfer of data frames from one computer to another. It provides link establishment and termination, frame traffic control and sequencing, frame delimiting and error checking in media access management (Highteck, 2016).

Network Layer: network layer controls the operation of subnet deciding physical path network conditions and priority of services. It provides routing, subnet traffic control, frame fragmentation, logical-physical address mapping and subnet usage accounting (Highteck, 2016).

Transport Layer: This layer ensures that messages are delivered error-free in sequence with no losses or duplications. It provides message segmentation, acknowledgement and traffic control with session multiplexing. Typically Transport Layer can accept relatively large message (Highteck, 2016).

Session layer: Session establishment between processes running on different station on this layer. It provides maintenance and termination with session support on other layer (Highteck, 2016).

Presentation Layer: Data to be presented to the application layer. It is a translator for the network. It provides character code translation, data conversion, compression and encryption for security (Highteck, 2016).

Application layer: It's for users and application processes to network services. This layer contains several of function. These are resource sharing and device redirection, Remote file and reader access, Process communication and network management, directory services and electric messaging with virtual terminals (Highteck, 2016).

C) Using Application: This networking infrastructure dental company use Microsoft office suite, web and e-mail with security software and tries to use Dentimax management application. This application has some features and version. These are appointment, patient account, claims, patient billing, clinical charting, patient record, document, reminders, imaging and treatment planning management (dentimax, 2015).

Protocols Layer: This application process has some protocol layer this protocol are send and processing in data application layer. Application layer has DNS, HTTP, SMTP, POP, DHCP, FTP protocol. This protocol is together work on application layer besides security, web and internet software works on a physical to application layer with firewall in network layer (Highteck, 2016).

D) Reasons of components operation: This century networking processes has some networking components. These are hub, switch, a wireless access point and router. This component using has reason and importance.

Hub: In computer networking system hub connected one computer from another computer. This hub is a component of network topology and first layer in OSI seven layer models (WebFinance Incorporation, 2016).

Switch: In OSI seven layer model switches operate on second layer. MAC addresses are firstly checking on these Switch systems. Switches use Application Specific Integrated circuits (ASIC's) in MAC address checking destination system (TechTarget, 2000).

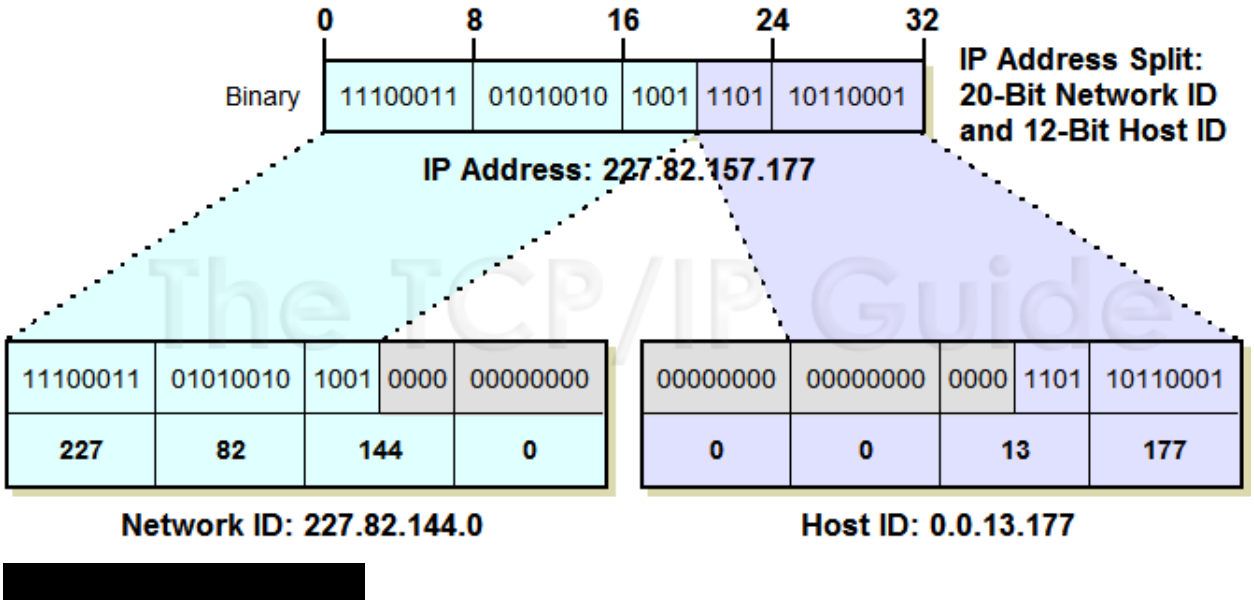
Wireless access point: This access point provides IP using DHCP on LAN side server. Connectivity provide between wired and wireless on this point (Stack Exchange Inc, 2016).

Router: in Modern technology router is a piece of equipment. Router when routing it use a Border Getaway Protocol (BGP). This protocol using shorted path algorithms in routing system (Fairhurst, 2001).

Task-2

A) **Importance of address:** Network addresses used in uniquely identify a node, which node from data send to another unique node. This node data transmission process needs a network address. This address is identifying which nodes send a data from another node. Network address is made up of 32 binary bits. This binary bit converted into 4 octets. Each octet equal 8 bite. Its range from 0 to 255(for example, 172.16.81.100) (Cisco Systems, Inc., 1987).

Differences in network and host address: Network and host address create on a 32 bits. This network and host address combined on an IP address. IP address binary process first 20 bits called network id and last 12 bits called host id. This binary bite converted to create on octal format creates on IP address. For example, IP address 227.82.157.177. This IP address logical diagram draws on there.



(Cisco Systems, Inc., 1987)

B) **Differences in private and public IPv4 address:** In a networking process there are two types of address use on data transmission processes. This public and private address has some differences.

Public address: This address is assigned to a computing device to allow direct access on the internet. It's globally unique ID on the internet. A public IP address can be either static or dynamic. A static public address can't be changed and used primarily for web page hosting on the internet. It's assigned by Internet service provider. When the computer disconnected on the internet then re-connected it gets a new IP on the internet (Technet Microsoft, 2010).

Private address: In addressing system public address system can't assigned on the private address. This address assigned within a Local Area Network (LAN) system. This address node requires globally unique on the IP network. Private address never duplicate on the public address. There are three type of range has on this address. These are Class A, B and C.

Class	Starting IP address	Ending IP address	No of hosts
A	10.0.0.0	10.255.255.255	16,777,216
B	172.16.0.0	172.31.255.255	1,048,576
C	192.168.0.0	192.168.255.255	65,536

(iplocation, 2006)

Using criteria: This Company Network addressing system can be used on class C networking address. This address can be connecting a lot of nodes on their networking processes.

C) **DHCP:** Dynamic Host Configuration Protocol (DHCP) is a network control protocol. This protocol automatically assigns an IP address in enabled server. A different range of network addresses automatically configured in nodes which is connected by network. When any network address is out of date this server generates a new IP address for definite time.

Using criteria: TCP/IP based network must have unique unicast IP addresses to access the network and its resources. DHCP enables this enters process to be automated and managed centrally. Valid TCP/IP configuration managed for all clients on the network. DHCP allows single IP address to single DHCP client besides DHCP server is configured an IP address for their clients. It provides a valid IP address in subnet for networking (Technet Microsoft, 2010).

D) **Difference in IPv4 and IPv6:** There are some several difference have on IP version 4 and 6. These are

IPv4	IPv6
This address is length in 32 bit.	This address is length in 128 bit.
This address binary number represent on a decimal number.	This address binary number represent on a hexadecimal number.
Broadcast message are available.	Broadcast message are not available.
Only optional support in IPsec.	Inbuilt IPsec support.
Internet Group Management Protocol (IGMP) used on this IP version.	Multicast Listener Discovery (MLD) Messages replace on IGMP places.

(Omnisecu, 2008)

Using criteria: IPv4 use in this company network addressing processes because this version network address is connecting an enough nodes in their DHCP server in network addressing systems.

E) **Default gateway:** In Computer networking architecture a default gateway is the device that passes networking signal from the local subnet to device on the other subnets. The default gateway often connects a local network to the internet although internal gateways for local networks.

Impotency: Default network gateways configure on ordinary computer instead on the router. Two network adapters use this gateway. One connected to the local subnet and another connects to the outside main network. In larger business environment routers or gateway computers can be used to network local subnets (Bradley Mitchell, 2016).

Example: In Microsoft Windows, the IP address of a computer's default gateway can be accessed in the 'ipconfig' or 'winipcfg' utilities on the internet.

F) **Subnet mask:** A Subnet mask is a 32-bit number that **masks** an IP address, and divides the IP address into network address and host address. Subnet Mask is made by setting network bits to all "1"s and setting host bits. Subnet mask is stored in the client machine on server or router. It's matched with the IP address on a packet it determine which network segment packet is fixed for it.

Example: Default Subnet musk has two types of natation these are dotted decimal and network prefix notation. There are three classes of natation table under the below down.

Address class	Bits for subnet mask	Subnet mask	Network prefix

A	11111111 00000000 00000000 00000000	255.0.0.0	/8
B	11111111 11111111 00000000 00000000	255.255.0.0	/16
C	11111111 11111111 11111111 00000000	255.255.255.0	/24

(Technet Microsoft, 2010)

G) **IP routing table:** A routing table is a set of rules, often viewed in table format that is used to determine where data packets travelling over the internet protocol. Routing table used on an all IP enabled devices in routers and switches on the internet (Technet Microsoft, 2010).

Example: The host on a single network adapter has IP address 157.55.27.90 subnet musk 255.255.255.0 and default gateway 157.55.16.1 shows the default routing table on Windows 2000 based local host system.

Task-3

a) **Security Concepts**: Cyber security increasingly process can be used different type security concept. There are three type of security concept are explain here. These are access control, Fire detection, intrusion detection. These concepts are creating in planning, installation, maintenance and monitoring services. It helps to understand that no single solution protects you from a variety of threats. Need multiple layers of security. IF one fails, other still stand. These are outline of security concept (securityconceptsusa, 2015).

b) **Ensure of secured connection:** There are so many ways to ensure of secured connection transferring data. Whether your company's protecting customer credit card information, securing remote user connections to your network or protecting your intellectual property from digital piracy, now a days using encryption every day. This encryption is ensuring of secure connection on internet (searchsecurity.techtarget, 2008).

c) **Security authentication:** Authentication is a process in which the credentials provided are compared to those on file in a database of authorized users' information on a local operating system or within an authentication server. If the credentials match, the process is completed and the user is granted authorization for access. This process is ensuring in security process in open access pc or Wi-Fi access pc in the local server on the internet (searchsecurity.techtarget, 2011).

d) **Network secure measures**: Over the last discussed multiple business-oriented security measures can use to keep information and end users safe from the challenges Ethernet in a connected in the world. Network security protecting in all data and information and keep yourself. In basic network infrastructure network environment need some

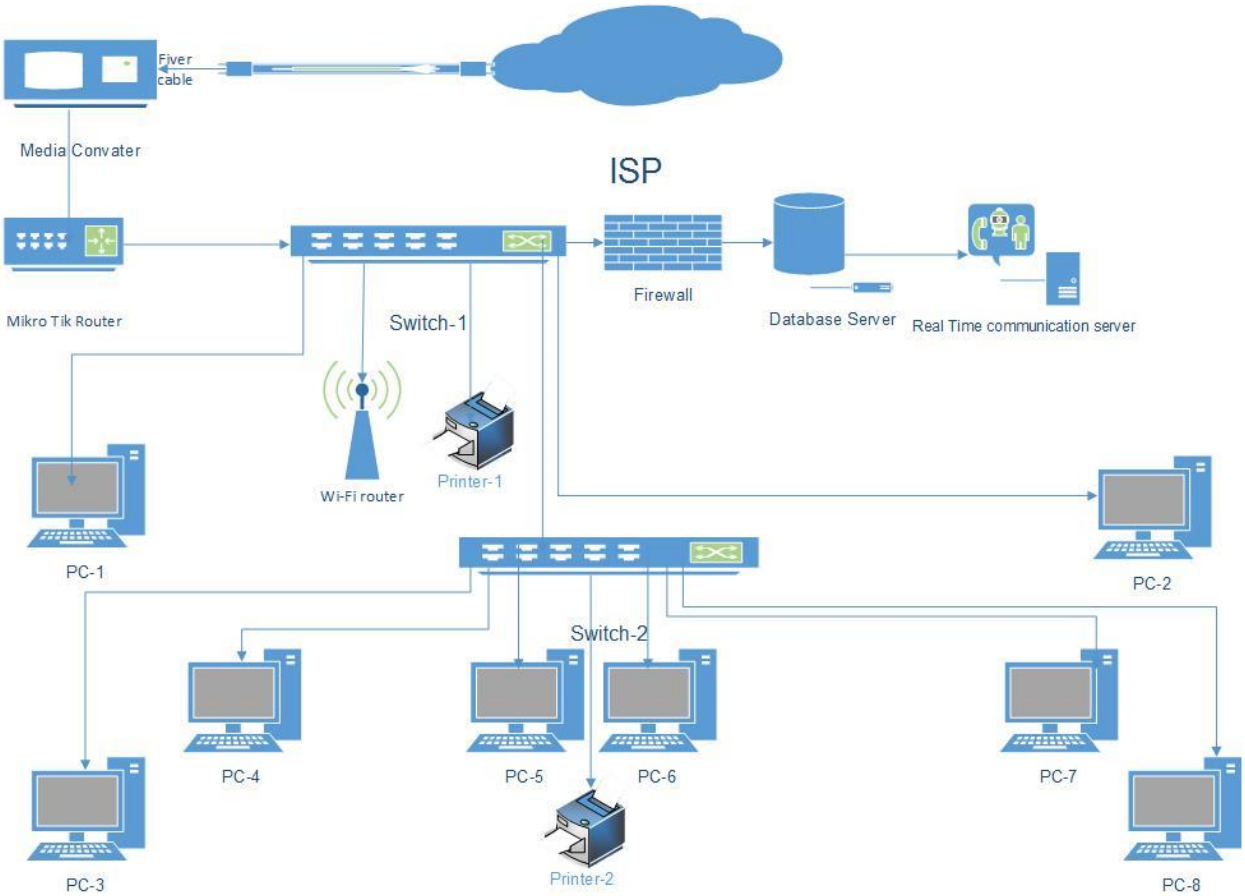
component and tools. These are Firewalls, Antivirus systems, Intrusion-detection systems, Patching and updating, General network tools, Port scanners, Network sniffers, Vulnerability scanners (google, 1998).

e) **System biggest thread:** There are some biggest threads in this networking system. Some biggest threads create a problem on data transferring system. These are Nation-state Attacks, Extortion, Data Destruction, Bank card Breach's, Third-Party Breaches. This type of process some dangerous thread are attack on this network system. Trojan virus is most of the dangerous virus on this century (California Privacy, 2012).

Answer justification: But these days, no threat predictions are complete if they don't address the looming threats posed by nation-state attacks, like the ones exposed by Edward Snowden. It's been said repeatedly that when a spy agency like the NSA undermines a system to gain access for its own use, it makes that system more vulnerable to attack by others. So we begin this list with that in mind.

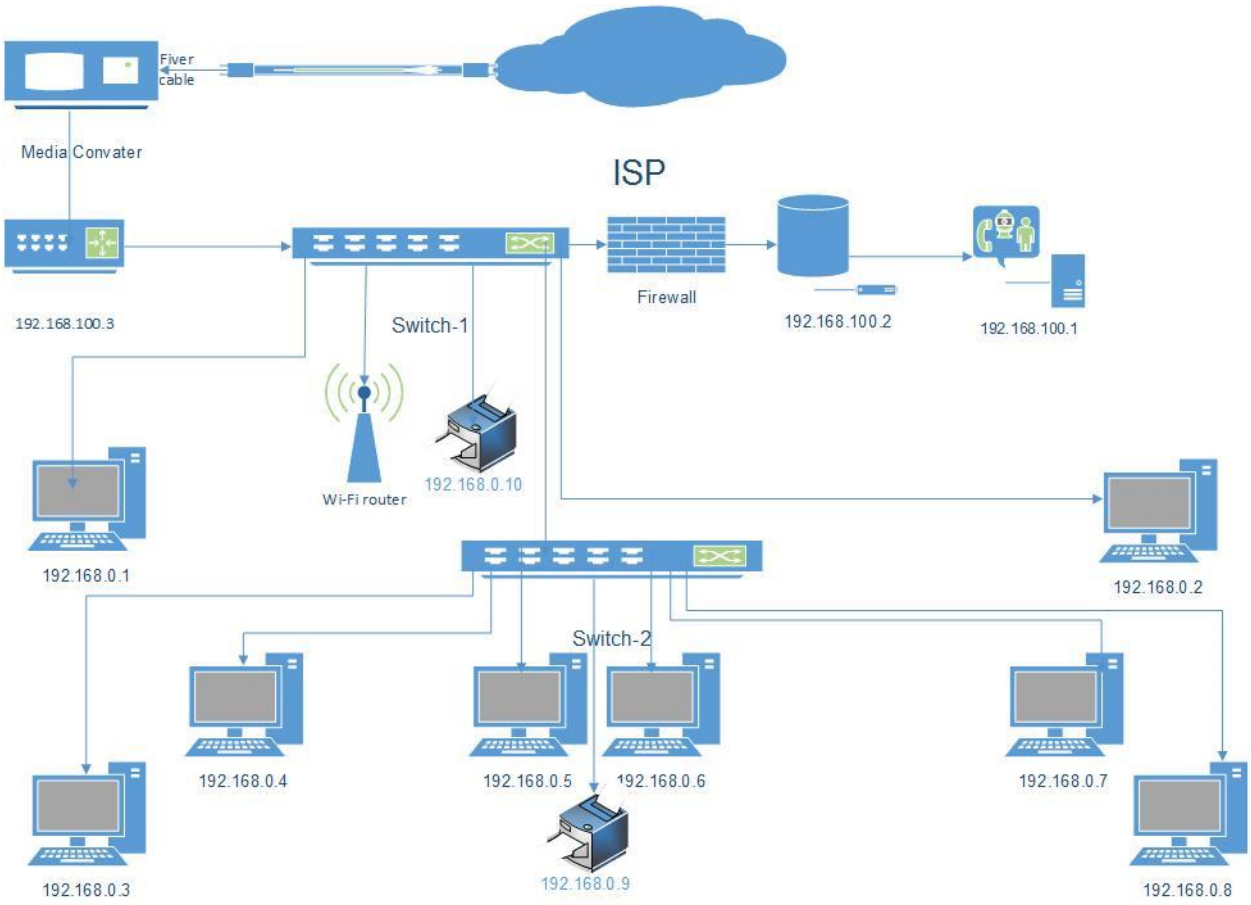
Task-4

A) `This is a Logical diagram with topology draw for SDS networking system besides this network system design shown on main components in this company networking system.



Logical Diagram with Topology

B) This company needs Real IP address and this address give on ISP provider. SDS company network addressing system used on a two type of IP address these are Public and private address besides their subnet mask create depend on their real IP using which class of IP give on ISP provider. In this circumstance SDS Company can be used on class C subnet mask. Default subnet mask is 255.255.225.0.



Logical Diagram with IP addressing

C) SDS networking diagram design use some advanced network technology with topology and hardware. This advanced features and technology is very important for secure network data transmission system. Star topology, security, Wi-Fi and VOIP telephone system use on every pc on this networking system because this is diagram very suitable for when their main branch access and connected on their network. This company networking system chooses some advanced technology hardware. This hardware component has some default security, protocol and advanced functionality these hardware are Media converter, Micromesh router and Firewall. When this component is connected on this way they are checking security. When their main branch want to access on this network there must be give security information then they can be access on this network otherwise this system can't give access on this network.

D) These component rates give on American dollar by amazon.com on but it converted to give British pound rate. When this company order on this component by amazon.com. This company gives a lot of opportunity on their sealing product and all Electronic items.

So, I recommended on this E-commerce website for SDS company buying their all hardware and software items.

No	Hardware & Software name With Model	Quantity	Price
1	Media Converter **(TP-LINK MC200CM Gigabit Media Converter)**	1	£33.73
2	Firewall **(Cisco ASA 5506-X with Firepower Services**)	1	£276.02
3	**Router** **(Mikrotik RB951G-2HND**)	1	£55.98
4	Switch **(Cisco SRW2024P 24-port Gigabit Switch)**	2	£533.72
5	Media & Application, Database and Real-time communication server **(HP ProLiant ML10 v2 4U Intel Core i3-4150 3.5 GHz 64-bit Micro Tower Server)**	3	£465.72
6	Printer **(HP Office Jet Pro 8710)**	2	£281.64
7	Wi-Fi Router **(TP-LINK AC3150**)	1	£154.90
8	VOIP phone **(AGPtEK® Hands-free Headphone)**	8	£90.08
9	Personal computer (PC) **(HP Business ProOne 400 G1)**	8	£3962.8
Total (Items & price)		28	£5799.33

NOTE: This rate is exchangeable by on their authority (amazon, 1994)

Task-5

a) **VOIP:** Voice over IP is an IP telephone facility on the internet. Its sand voice information over the internet. VOIP convert analog voice data into digital data in packet. It's used a real time and two way data transmission processes in same time in advanced technology. VOIP or internet telephony don't need a tolls or charge on ordinary telephone services (compnetworking, 2016).

b) **Incorporating System:** Every VOIP network has interface with Public Switched Telephone Network (PSTN) or Public Land Mobile Network (PLMN) on VOIP system. VoIP allows you to minimize Private Branch Exchange (PBX) hardware and eliminates the need to maintain idle telecom circuit capacity. A PBX with VoIP other apps can interact with the same service. Remove the central hardware infrastructure from the premise and leaving behind a small footprint on VoIP phones and adapters, and providing a standard API for application access on the internet (ShoreTel, 1996).

Components: There are most four components are important on VOIP networking system. These are

1. Signaling Gateway Controller.
2. Media Gateway.
3. Media Server.
4. Application Server (Stelios Antoniou, 2014).

Outline of actions: Every component is providing a different type of action the VOIP component. These are:

- The Signaling Gateway Controller (SGC) known as a call agent on their media gateway control function.
- The RTP transmission protocols use the voice packets.
- A Media Server is used where added features are needed in voicemail or video conferencing.
- Application Server provides value-added services on the IP network.

c) **Impact on Network performance:** Local area network or internet are connected the phone call in voice over IP on the internet. This system baseline identifying current device resource utilization and recommended potential component impact on IP Telephony traffic. A baseline is Simple Network Management Protocol (SNMP) over an extended period of several days on a week. This is normally done for CPU, memory, backplane utilization and LAN buffers. Most SNMP tools will allow the organization to collect and graph the utilization over this time on VOIP system (Pearson Education, 1996).

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