Application Layer Functionality and Protocols These presentations are the result of a collaboration among the instructors at St. Clair College in Windsor, Ontario.o IBM Lotus Notes o Novell Groupwise o Microsoft Exchange o Web based e-mail: o Hotmail o Gmail E-Mail Protocols Post Office Protocol (POP3): o Uses TCP port 110 o Download-and-delete mode: o Retrieves messages from the server o Stores the message locally o Deletes the message from the server o Download-and-keep mode: o Does not delete messages on server when retrieved.Internet Message Access Protocol (IMAP): o E-mail is not downloaded, but retained on server o Any received email is associated with the user's INBOX o Users can create and manage remote folders o Users can retrieve portions of the email: o Message header: Subject line and Sender o Web Based E-mail: o Introduced with Hotmail in mid-1990's.o A – an end device address o NS – an authoritative name server o CNAME – the Fully Qualified Domain Name o MX – mail exchange record to identify mail servers WWW Service and Hypertext Transfer Protocol HTTP Web browsers are the client applications used to interpret the HTTP application protocol received from a web server.o The resolver is responsible for issuing requests and processing responses from the DNS server Domain Name System (DNS) All DNS servers store different types of resource records to resolve names.Application Layer Functionality and Protocols Applications: The Interface Between the Networks Application Layer – OSI and TCP/IP Models The Application layer is the top layer of both the OSI and TCP/IP models.o The Telnet daemon resumes listening and repeats the process for each unique connection Peer-to-Peer (P2P) Networking Two or more computers are connected via a network and can share resources (such as printers and files) without having a dedicated server.Functionality of the TCP/IP Application Layer protocols fit roughly into the top three layers of the OSI Model.o Most TCP/IP application layer protocols were developed before PCs, GUIs and multimedia objects.o Three methods: o Client/Server Model o Application Layer Services and Protocols o Peer-to-Peer (P2P) Networking and Applications The biggest advantage of the client/server model is the centralization of resources.o Sends the requested data in the proper format Application Layer Services and Protocols Typically, a server will have multiple clients requesting services at the same time.o In other words, in this model, every client is a server and every server a clien Application Layer Protocols and Services Examples Commonly used protocols: o The OSI Model Transport Layer uses an addressing scheme called a port number.E-Mail Server Processes: MTA and MDA Other alternatives with their own internal e-mail format and proprietary protocol.Dynamic Host Configuration Protocol DHCP IP addresses and other configuration information can be obtained dynamically.o Linux / Unix have a similar protocol – SAMBA SMB messages can: o Start, authenticate, and terminate sessions.o They implement the application layer protocols and are able to communicate directly with the lower layers of the protocol stack.o Email Clients o Web Browsers Application Layer Services: o Other programs may need the assistance of Application Layer services to use network resources such as: o File transfer o Network print spooling o These services are the programs that interface with the network and prepare the data for transfer.o Are described as "listening" for a request from a client. o Programmed to respond whenever the server receives a request for the service provided by the daemon. o When a daemon "hears" a request from a client: o It exchanges appropriate messages with the client.Domain Name System (DNS) The DNS protocol defines an automated service that matches resource names with the required numeric

network address.o Examples: o Apache, Microsoft Internet Information Server (MIIS) HTTP is a request/response type of protocol.o Simple Mail Transfer Protocol (SMTP) o Post Office Protocol (POP and POP3) o Internet Message Access Protocol (IMAP) E-Mail Server Processes: MTA and MDA Mail Transfer Agent (MTA): o Used to forward e-mail.IP address o Subnet Mask o Default Gateway o Domain Name o DNS Server o Others....Application Layer – OSI and TCP/IP Models Two important concepts: o Application Layer: o The first step for getting data on to the network.Application Layer Software Within the Application layer, there are two forms of software programs or processes that provide access to the network: o Applications o Services Network-Aware Applications: o The software programs used by people to communicate.o If anyone finds any errors or omissions, please let me know at: o tdame@stclaircollege.ca.o Provides the interface between the applications we use to communicate and the underlying network.Making Provisions for Applications and Services Introduction When accessing information on a device, the data may not be physically stored on that device.All Policies and User Names and Passwords must be maintained on each peer device.Peer-to-Peer (P2P) Applications A peer-to-peer application, unlike a peer-to-peer network, allows a device to act as both a client and a server within the same communication.o Server programs generally use predefined port numbers that are commonly known by clients.o DHCP servers can be on a LAN, on a router or at an ISP.o IBM in the late 1980s o Describes the structure of shared network resources o Directories, files, printers, and serial ports.o For example: o When displaying a web page: o The Application Layer uses the HTTP Protocol.o They implement very little of the Presentation and Session layer functionality.o The Telnet daemon listens for connection requests that are received on port 23.o End devices (peers) can function as either a server or client depending upon the required service.One big disadvantage of P2P networking is that it decentralizes the services on a multiuser network.However, instead of the client being a browser or email client application, the DNS client (Resolver) runs as a service itself.o When a client requests a web page, HTTP defines the types of messages exchanged.e.g. GET, PUT, POST E-Mail Services and SMTP/POP Protocols Revolutionized how people communicate.o They can be accessed remotely by sites on a WAN.