

COMPUTER SCIENCE

Basic Networking Concepts

Continuation

The TCP/IP Model -Consists of only 4 layers: application, transport, internet and network. Layers Application layer (applications and processes running on the network) Transport layer (provides end-to-end data delivery services) Internet layer (makes datagrams and handles data routing) Network layer (provides routines allowing access to the physical network) 19 Network layer -Provides the same functionality as the physical, the data link and network layers in the OSI model. -Mapping between IP addresses and network physical addresses. -Encapsulation of IP datagrams, e.g packets, in format understandable by the network. Internet layer -Lies at the heart of TCP/IP. -Based on the Internet Protocol (IP), which provides the frame for transmitting data from place A to place B. Transport layer - Based on two main protocols: TCP (Transmission Control Protocol) and UDP (User Datagram protocol) Application layer

-Combines the functions of the OSI application, presentation, and session layers. -Protocols involved in this layer: HTTP, FTP, SMTP etc.

20 4. Networks Interconnection/Internet Concept of Network Interconnection

-First implemented in the Defense Advanced Research Project Agency Network (Arpanet), in 1966 in USA. -Consists of connecting several computer networks based on different protocols -Requires the definition of a common interconnection protocol on top the local protocols. -The Internet Protocol (IP) plays this role, by defining unique addresses for a network and a host machine.

FTP Telnet SNMP SMTP TCP/UDP IP Ethernet Arpanet Token ring

21 P2 P1 P4 P3 IP 22 Internet Protocol (IP) Overview

-The IP protocol provides two main functionality: →Decomposition of the initial information flow into packets of standardized size, and reassembling at the destination. →Routing of a packet through successive networks, from the source machine to the destination identified by its IP address. -Transmitted packets are not guaranteed to be delivered (datagram protocol). -The IP protocol does not request for connection (connectionless) before sending data and does not make any error detection. Functions -Decompose the initial data (to be sent) into datagrams. -Each datagram will have a header including, the IP address and the port number of the destination. -Datagrams are then sent to selected gateways, e.g IP routers, connected at the same time to the local

network and to an IP service provider network. 23 Sender Receiver packet1 packet2 Routers -Datagrams are transferred from gateways to gateways until they arrived at their final destination. 24 Structure of an IP packet -The fields at the beginning of the packet, called the frame header, define the IP protocol's functionality and limitations. -32 bits are allocated for encoding source and destination addresses (32 bits for each of these address fields). -The remainder of the header (16 bits) encodes various