



ECONE index cards

Computer Networks (Politechnika Warszawska)

Test 1 - NOV 2017

Mention the dominant WAN network technologies from
80's and 90's

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Pobrane przez irx xri (irx32528@eveav.com)

X-25

Frame Relay

ATM

IP

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When did the Internet appear ?

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Pobrane przez irx xri (irx32528@eveav.com)

- Beginning of 1970's - Arpanet opened for public usage
- Beginning of 1980's - RFC defining IPv4 and TCP protocols appeared

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What was the reason for NAT introduction into the Internet?

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Shrinking address space of IPv4

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What are the advantages of network bus topology?

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Broadcast and multicast are:

- very fast
- low cost - one interface per device, no switches
- suitable for radio communication

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What are the advantages of circuit switching?

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- Fixed bandwidth
- Delays and jitter
- In consequence good for real-time applications

What is the reason of packet congestion in computer networks ?

Incoming packets overflow buffers or collide in a shared transmission medium, causing retransmissions. As a result, there are more and more packets, which block the network

What kind of standards (for computer networks)
does IEEE provide?

Standard for 1st and 2nd OSI ISO layers

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A communication protocol - what is it?

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A system that realizes a set of rules, which governs cooperation between autonomous entities

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List the principal functions of the 3rd OSI ISO layer

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- Node addressing
- Flow multiplexing
 - Packet segmentation
 - Concatenation
 - Grouping
 - Regrouping
- Routing
- Network and users administration

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What is the structure of the MAC-48 address?

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- Individual/group address flag
- Universal/local address flag
- Organizational Unique Identifier
- Serial number (Network Interface Card)
- Group address

What is the meaning of all 0's IP address in a given sub-network?

Unknown source address of default destination

What are the main functionalities of ICMPv4?

- Self-recovery from errors in the network
- Connectivity testing
- Router and subnet advertising

What do the Don't-Fragment and More-Fragment flags in the IP header serve for?

DF-Flag is used for discovery of Maximum Transfer Unit size

MF-Flag set to 0 indicates the last fragment of a given packet.

When set to 1 indicates that is isn't the last one (there are more fragments)

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What is the aim of interior routing protocols?

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To find routes inside a given network in an efficient way

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What are advantages of multipath routing ?

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Very fast recovery from a link or node failure.

Possibility to send data faster via parallel paths

When is static routing a good choice for a given network?

In static networks, when energy consumption has
to be minimized

What was the reason for introducing the Autonomous System?

To make the Internet scalable and easier to administer

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In which decade the first computer networks appeared?

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In 50's

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What were the services offered by Arpanet?

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-Remote login

-File transfer

-Email

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What was the main reason for IPv6
construction?

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The lack of free public IPv4 addresses

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What means "packet switching"?

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It is technique of message transmission over linked nodes.

The message is split into small packets that are transmitted separately.

They can travel via the network passing subsequent links in parallel.

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What is the reason for SDU (Service Data Unit) segmentation ?

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If the chunk of data carried by an SDU is bigger than maximum size of payload supported by PDU (Protocol Data Unit), the protocol instance has to segment (fragment) the data into smaller chunks

What is the main responsibility of the Internet Registry organizations (i.e. RIPE) ?

IANA oversees global IP address allocation, autonomous system number allocation, media types and other Internet Protocol-related symbols and Internet numbers.

A regional Internet Registry manages the allocation and registration of Internet number resources (e.g. IP addresses and autonomous system numbers) within its region of the world.

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List the principal functions of the 5th OSI ISO layer

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The session layer provides synchronization points and activity management functions, which help management of a communication session.

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Give the names of the layers defined by the
TCP/IP protocol stack model

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There are:

- applications
- transport
- network
- network interface layers

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What is the difference between 2nd layer switch
and the 3rd layer switch?

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The layer 2 switches forward packet looking at MAC addresses.

The layer 3 switches forward packets looking at IP addresses.

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What is the difference between MAC-48 and
EUI-48 addresses ?

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The distinction between EUI-48 and MAC-48
identifiers is purely nominal:

MAC-48 is used for network hardware

EUI-48 is used to identify other devices and
software.

They are syntactically indistinguishable and
assigned from the same numbering space

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What is the host number pointed by the IPv4
addresses 197.202.233.64/24 ?

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64

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What is the meaning of the 197.202.233.0/24
IPv4 address in the subnet?

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It points a default route, when used as a destination address.

It means "I have not yet assigned IP address", when used as a source address.

What for a host uses DHCP (Dynamic Host Configuration Protocol)?

DHCP distributes network configuration parameters, such as IP address for interfaces, services and bootstrap file localization.

It allows for dynamic IP address assignment, leasing addresses for defined time period.

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What for is the hop count field in the IP header?

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To drop a packet that circulates over a temporary loop.

The mechanism protects switches against congestion.

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What for is the protocol field in the IP header?

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To recognize the subsequent protocol that should obtain the packet for processing (eg TCP, UDP, ICMP)

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What metrics can be used by a routing protocol?

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- Hop count

- Bandwidth

- Delay

- Load

- Reliability

- Cost

What are the important features of the OSPF protocol?

It is an interior gateway (intradomain) link-state routing protocol.

It is open standard and scalable.

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In which decade Arpanet appeared ?

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In 1971 Arpanet was opened to the public use

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What were the main enablers of Internet expansion?

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- Easy and open access for writers and readers to RFCs
- Free UNIX 4.3 BSD with TCP/IP software
- Web browsers easy to use for non-qualified users

What was the main reason for NAT (Network Address Translation) construction?

To overcome the problem of shortage of public
IPv4 addresses.

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What means "circuit switching"?

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Is is a method of data interchange in which two network nodes establish a dedicated communications channel (circuit) before the nodes may communicate. The circuit guarantees the full bandwidth of the channel and remains connected for the duration of the communication session. The circuit functions as if the nodes were physically connected as with an electrical circuit.

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What is the reason for SDU (Service Data Unit) grouping?

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If for any reason (e.g. cost or time efficiency) is better to transport several data chunks carried by subsequent SDUs in a single PDU (Protocol Data Unit), a protocol should group them before sending and split up after reception.

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What is the main responsibility of Internet
Engineering Task Force?

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IETF develops and promotes standards for Internet. It is an open standards organization, with no formal membership or membership requirements.

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List all principal functions of the 6th OSI ISO layer

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- Data context negotiation
- Data translation from host to network representation
- Compression
- Ciphering

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Give the names of layers defined by the OSI ISO protocol stack model

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There are:

- Application
- Presentation
- Session
- Transport
- Network
- Data link
- Physical layers

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What is the difference between the 2nd layer switch and the network bridge?

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A bridge transforms packet from one LAN to other one (eg. Token Ring to Ethernet or Ethernet to WiFi).

A multiport bridge is called layer 2 switch, which forwards packets looking at MAC addresses. Most of the switches have only Ethernet interfaces and do not translate the headers.

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What is structure of MAC-48 address?

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There are two flag bits:

Individual/grouping (unicast/multicasts) and universal/local.

If it is a universal address, then 3 bytes (without the two bits) carry an Organizational Unique Identifier and the subsequent 3 bytes carry a manufacturer assigned number or a multicast group number.

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What is the host number pointed by the IPv4 address 197.202.32.64/16?

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Host address is 0.0.32.64, thus the number is

$$8129 + 64 = 8296$$

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What is the meaning of the 197.202.255.255/16
IPv4 address in the subnet?

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It is the broadcast address.

What for a host uses ARP and RARP (Reserve Address Resolution Protocol) ?

The ARP server responds with the MAC address that is assigned to the querying device on the base of its IP address.

The RARP server responds with the IP address that is assigned to the querying device on the base of its MAC address

What for is the Type of Service/Traffic Class field in the IP header?

To enable routers sending packets using different priority queues

What for is the port number field in the TCP header?

To point a process of a given terminal node that is involved in the communication.

It enables to recognize the end point application protocol (eg. smtp, ftp, http)

What kind of networks uses reactive routing protocols?

Those which changes frequently topology and
whose with infrequent traffic over few paths.

What does it mean that BGP is a path-vector protocol?

BGP's path vector routing information includes the 'path' of ASes that are used to reach the destination.

Mention the dominant LAN network technologies
from 80's and 90's

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- Ethernet
- Token Ring
- LocalTalk
- ARCNET

When did the Internet start to be widely used?

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In the beginning of the 1990's

Thanks to WWW technologies and low access
prices

What was the reason for IPv6 creation?

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Small address space of IPv4 that was an obstacle
for Internet expansion

What are advantages of network star topology?

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It is simple to design and build

What are virtual circuits in the context of packet switching?

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Virtual circuit switching is a packet switching methodology whereby a route is fixed between the source and the destination before data transmission. It is a service offered by a network operator. The service is extra paid and offers connectivity between remote points in minimum time, due to preprogrammed paths known by the switches. There is a special address poll for distinguishing virtual circuits

What network topologies (signal propagation) are congestion resistant?

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Ring topology

RFCs maintained by IETF - what kind of documents they are?

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It is free and open from of publication, to convey new concepts, information, or even engineering humor. Some of RFCs are accepted as Internet Standards

What is the meaning of PDU and SDU in OSI
ISO reference model?

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Protocol Data Unit - a data structure exchanged between peer instances of the same protocol.

Service Data Unit - a data structure exchanged between neighbouring instances on the same protocol stack.

List the principal functions of the 4th OSI ISO layer.

Transport addressing (i.e. a process or a service running on a given terminal node), connection quality negotiation(if supported).

Are there any special bits in the MAC-48
address structure?

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- Individual/group address flag
- Universal/local address flag

What is the meaning of all 1's IP address in a given sub-network?

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Broadcast

Why ICMPv6 had to replace ICMPv4 to support IPv6 networks?

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ICMP carries IP addresses, which have different length in these protocols.

Why there is no check-sum field in the IPv6 header?

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To speed up packet processing by routers.

What is the aim of exterior routing protocols?

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To distribute data on available paths via Autonomous Systems to a given IP subnetwork, to enable fulfillment of administration policies (related to financial and security issues) defined by AS owners.

What are advantages of hierarchic routing?

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- Enables routing scalability
- Reduces volume of exchanged routing data
- Reduces processor and memory consumption by routing processes.

Where is RIP a good choice for a given network?

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RIP is a good choice for small and static networks, where low cost of infrastructure is important

What is the aim of Interior BGP routers?

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*I*BGP runs between two BGP routers inside the same AS. It serves as a cache for routing information, providing faster data access for internal routers.

Test 2 - Jan 2018

What are the so called low and high watermarks
of reception data buffers?

They are indexes of input buffer that trigger sending respectively requests for start and stop data transmission

Test 2 - Jan 2018

Why PPP (Point - to - point protocol) is better
than SLIP (serial line IP) ?T

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The PPP allows for:

- connection diagnostic
- transmission configuration
- control flow
- authentication

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What is the difference between multimode and single mode fibers?

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The diameter of the fiber.

The single mode fibers allow transmission on long distances but they are more expensive

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Which Ethernet version do work without frame collisions of transmission?

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Anyone that is point-to-point full duplex
i.e. all interfaces:

- 10, 40, 100 Gb/s
- most of 1Gb/s
- some of 100Mb/s and 10Mb/s

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What is the aim of Spanning-Tree protocols in Ethernet networks?

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The aim is to break loops in the network, to avoid endless circulation of frames.

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Compare UDP with TCP regarding:

- connectivity
- reliability
- speed
- data synchronization

UDP:

- connection less
- unreliable
- fast
- datagram protocol (the datagram carries a message, thus the message synchronization is not needed)

TCP:

- connection-oriented
- reliable
- relatively slow
- providing byte stream transmission (thus synchronization of messages / data structures ~~can be needed~~)

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What are the advantages of EPON (Ethernet Passive Optical Network) ?

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- less fibers
- less optical ports
- no power supply for a splitter
- easier to manage
- cheaper to maintain

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How does explicit congestion notification work on IP networks?

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A heavily loaded router, before congestion occurs, stamps IP packets with ECN bit.

Than addressed computer gets to know that the path is overloaded and it is needed to reduce the transmitted volume of data. In the case of TCP connection, the announced receiver window size is reduced and appropriate flag bit is set in the TCP acknowledgment message that is send back.

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What kind of network service should be based on
the iterative server schema ?

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Such service that responds for a request with a short message, and a client sends the requests not frequently.

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Why are there active and passive openings of TCP connection?

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A server uses passive opening to wait for a client request

The client uses active opening to fix a connection with the server

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What are the functions of an SNMP agent?

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It collects management information about its local environment and stores control data as defined in the device's MIBs

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When a certificate revocation list is updated?

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Each time a valid private certificate is declared
as lost or stolen

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What are the main functional difference between POP (Post office protocol) and IMAP (Internet message access protocol) ?

Both are used by local e-mail clients to retrieve e-mail from a remote server.

IMAP unlike POP allows multiple clients simultaneously connected to the same mailbox.

Moreover IMAP allows managing mail folders on the remote server, so a user can access them from different devices. While POP just moves received emails to local computer.

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Describe Diffie-Hellman key exchange

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The Diffie-Hellman key exchange method allows two parties that have no prior knowledge of each other to jointly establish a shared secret (the key), without sending it via the network. Next, the key can be used for symmetric cyphering. The method relies on the equality $(g^a)^b = (g^b)^a$, the value is the secret key. Via network are sent: g ,

$$g^a, g^b$$

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What are main advantages of IPv6 ?

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- Huge address space
- No need to use network address translation
- Perfect auto-configuration
- Built in mobility mechanisms
- Routers can work faster

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What is the operational principle of MPLS
(Multiprotocol Label Switching) ?

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1. Every packet gets a label on a network border
2. Label identifies destination point
3. Internal nodes switch packet using the label
4. Boarder router restore the original packet

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How can be done authentication in PPP (Point-to-Point Protocol) ?

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Using:

- password exchange
- challenge exchange
- RADIUS
- IPsec

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Why do a preamble have to start a frame in CSMA and CSMA/CD (Carrier Sense Multiple Access / Collision Detection) protocol?

There is no signal in the medium between frames transmitted via CSMA and CSMA/CD protocols.

To correctly decode a signal to bits, the receiver clock must be synchronized with incoming signal. For this reason the preamble (a given bit sequence) is added to the start of protocol header.

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Can one fiber be used to transmit and receive
signals? Why?

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Yes, using two wavelengths.

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What is the aim of VLANs (Virtual Local Area Network) ?

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Configuration of separated LANs over one physical infrastructure, to raise efficiency and security of the network

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What is the reason to minimal frame length has to be defined in a CSMA/CD protocol?

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To guarantee that every node in the network
segment can hear a collision

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Why do we need the silence after connection timer?

What is the consequence of it when a network application is designed?

To guarantee that no one IP packet from previous connection (delayed in a congested router queue) arrive to the destination during the next connection, which would break reliability of TCP

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What are the standard Ethernet transmission speeds?

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- 10 Mb/s
- 100 Mb/s
- 1Gb/s
- 10Gb/s
- 40 Gb/s
- 100 Gb/s

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Mention at least 3 other (than UDP and TCP) transport layer protocols. What for do we use them?

Real-time Transport Protocol - for multimedia streaming.

Datagram congestion Control Protocol - for fast transfer of datagrams respecting congestion fairness

Wireless Transmission Control Protocol - for efficient TCP connections over wireless links.

UDP little - to allow a potentially damaged data payload to be delivered to an application rather than being discarded by the receiving station

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Can we use TCP for multicast transfer and why?

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We cannot.

TCP support point - to - point double direction
reliable data transfer.

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What are important differences between versions
of SNMP (Simple Network Management
Protocol) ?

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In version 1: Only one network administrator
and no security

In version 2: Support for many administrators
(SNMP views and communities)

In version 3: Complex mechanisms for
identification, privacy and control access, for
many administrators.

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How a stream cipher works?

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It operates on digit (bit or byte) in the time of
data transmission

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What for HTTP (Hypertext Transfer Protocol)
proxies are used ?

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- Faster response
- Lower bandwidth consumption
- Lower server load
- Security control
- Captive portal for network/internet access control
- Different conversions of transported data

Test 2 - Jan 2018

What is it anycast address, and for what is it used (example of applications)?

It is a group address of receiving nodes, and only one of the nodes is selected by the network for a packet delivery. These addresses are used e.g., by routing protocols and security applications.

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What does public key infrastructure?

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Organizational and technical infrastructure for providing for third party vetting of, and vouching for, user identities. The infrastructure consists in Registration Center, Certification Center, and Public Repository.

Test 2 - Jan 2018

What are main disadvantages of NAT (Network Address Translation)?

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Main Internet concept is broken – no peer-to-peer visibility disturbs many applications.

NAT server is a bottleneck for network throughput. Battery save terminals cannot be placed behind a NAT. Disable integrity verification of IP headers (IPSec).

Test 2 - Jan 2018

What are the advantages of MPLS Multiprotocol Label Switching?

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- Well suited to service VPNs supporting Class of Services
- Efficient traffic engineering mechanisms

Exam

List all OSI ISO layers

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1. Physical layer
2. Data link layer
3. Network layer
4. Transport layer
5. Session layer
6. Presentation layer
7. Application layer

Exam

Give short description of 1st OSI ISO layer

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- Mechanical
- Electrical details coding
- Signals

Exam

Give short description of 2nd OSI ISO layer

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- Bit
- Frame synchronization
- Bit error detection / correction
- Control flow

Exam

Give short description of 3rd OSI ISO layer

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- Node addressing
- Multiplexing
- Segmentation
- Concatenation
- Grouping and regrouping
- Network and users administration
- Error detection and correction
- Control flow

Exam

Give short description of 4th OSI ISO layer

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- Transport addressing
- Connection quality negotiation
- Segmentation
- Concatenation
- Grouping and regrouping
- Error detection and correction
- Control flow

Exam

Give short description of 5th OSI ISO layer

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- Synchronization points
- Activity management

Exam

Give short description of 6th OSI ISO layer

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- Data context negotiation
- Data translation: host-network representation
- Compression
- Ciphering

Exam

Give short description of 7th OSI ISO layer

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- Email
- File transfer
- Distributed transactions
- Directory services

Exam

Describe shortly ARP

- its purpose
- how it works

Address Resolution Protocol (ARP) is a telecommunications protocol used for resolution of network layer addresses into link layer addresses, a critical function in multiple-access networks. The ARP is a request and reply protocol that runs encapsulated by the line protocol. It is communicated within the boundaries of a single network, never routed across internetwork nodes. This property places ARP into the Link Layer of the Internet Protocol Suite,[2] while in the (OSI) model, it is often described as residing between Layers 2 and 3, being encapsulated by Layer 2 protocols. However, ARP was not developed in the OSI framework (Inverse ARP or InARP) is used to obtain Network Layer addresses (for example, IP addresses) of other nodes from Data Link Layer (Layer 2) addresses. It is primarily used in Frame Relay (DLCI) and ATM networks, in which Layer 2 addresses of virtual circuits are sometimes obtained from Layer 2 signaling, and the corresponding Layer 3 addresses must be available before those virtual circuits can be used.

Exam

Describe SLIP

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Serial line protocol (SLIP) is an older protocol used to handle TCP/IP traffic over a dial-up or other serial connection. SLIP is a physical layer protocol that doesn't provide error checking. Such as modem error checking. It only supports the transmission of one protocol, TCP/IP. A later version of SLIP, called compressed SLIP (CSLIP), became available though the name says compressed; the protocol actually just reduces the amount of information in the headers, and does not compress the transmission.

Exam

Describe PPP (point to point) protocol

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Point to point protocol (PPP) is much more robust than its earlier cousin, SLIP. PPP provides a physical and data link layer functionality that fixes many problems with SLIP. At the data link layer, PPP provides error checking to ensure the accurate delivery of the frames that it sends and receives. PPP also keeps a logical link control communication between the two connect devices by using the Link Control Protocol (LCP). PPP also supports the dynamic configuration of the dialled-in computer.

Unlike STIP, where your addresses and other information have to be hard-coded ahead of time, PPP allows the client computer to receive its information from the host it dials into. Most internet dial-up connections today are made using PPP over modem or ISDN.

Exam

What is the principal reason that packets lost in
Ethernet segments and in Internet?

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Packet loss can be caused by a number of factors including signal degradation over the network medium due to multi-path fading, packet drop because of channel congestion, corrupted packets rejected in-transit, faulty networking hardware, faulty network drivers or normal routing routines

Exam

How a VLAN can be created?

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Before you can create a VLAN, the switch must be in VTP server mode or VTP transparent mode. If the switch is a VTP server, you must define a VTP domain name before you can add any VLANs. Define a VTP domain name. You must define the VTP domain name regardless of:

- The number of switches in the network, whether one or many

Whether you use VTP in order to propagate VLANs to other switches in the network

Issue the `set vtp` command in order to set the domain name and mode.

Issue the `show vtp domain` command in order to verify the VTP configuration.

After you set and verify the VTP domain, begin to create VLANs on the switch.

By default, there is only a single VLAN for all ports. This VLAN is called default. You cannot rename or delete VLAN 1. Issue the `show vlan` command in order to display the parameters for all configured VLANs in the administrative domain.

Issue the `set vlan` command in order to create VLANs.

Issue the `show vlan` command in order to verify the VLAN configuration.

If you want to add ports to the VLAN, issue the `set vlan vlan_number mod/ports` command.

Issue the `show vlan` command in order to verify the VLAN configuration.

Exam

How TCP avoids network congestion?

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Avoiding link saturation and thus packet drops
and unnecessary retransmission.

2 phases:

- slow-start
- congestion avoidance

Additional features:

- fast retransmit
- fast recovery

Exam

Describe shortly the principles of Domain Name System

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The Domain Name System (DNS) is a hierarchical distributed naming system for computers, services, or any resource connected to the Internet or a private network. It associates various information with domain names assigned to each of the participating entities. Most prominently, it translates domain names meaningful for users to the numerical IP addresses needed for the purpose of locating computer services and devices worldwide. By providing a worldwide, distribute keyword-based redirection service, the Domain Name System is an essential component of the functionality of the Internet. An often-used analogy to explain the Domain Name System is that it serves as the phone book for the Internet by translating human-friendly computer hostnames into IP addresses. For example, the domain name `www.example.com` translates to the addresses `192.0.43.10` (IPv4) and `2620:0:2d0:200::10` (IPv6).

Exam

Describe authentication process that uses asymmetric cipher.

In cryptography, an asymmetric key algorithm uses a pair of different, though related, cryptographic keys to encrypt and decrypt. The two keys are related mathematically; a message encrypted by the algorithm using one key can be decrypted by the same algorithm using the other. In a sense, one key "locks" a lock (encrypts); but a different key is required to unlock it (decrypt). Public-key cryptography refers to a cryptographic system requiring two separate keys, one of which is secret and one of which is public. Although different, the two parts of the key pair are mathematically linked. One key locks or encrypts the plaintext, and the other unlocks or decrypts the ciphertext. Neither key can perform both functions by itself. The public key may be published without compromising security, while the private key must not be revealed to anyone not authorized to read the messages.

Exam

What is principal idea of MPLS?

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Multiprotocol Label Switching (MPLS) is a mechanism in high-performance telecommunications networks that directs data from one network node to the next based on short path labels rather than long network addresses, avoiding complex lookups in a routing table. The labels identify virtual links (paths) between distant nodes rather than endpoints. MPLS can encapsulate packets of various network protocols. MPLS supports a range of access technologies, including T1/E1, ATM, Frame Relay, and DSL

Exam

What are the purposes and principles of
Internet subnetting?

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Subnetting is the process of designating some high-order bits from the host part and grouping them with the network mask to form the subnet mask. This divides a network into smaller subnets. The benefits of subnetting vary with each deployment scenario. In the address allocation architecture of the Internet using Classless Inter-Domain Routing (CIDR) and in large organizations, it is necessary to allocate address space efficiently. It may also enhance routing efficiency, or have advantages in network management when subnetworks are administratively controlled by different entities in a larger organization. Subnets may be arranged logically in a hierarchical architecture, partitioning an organization's network address space into a tree-like routing structure.

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Exam

Describe shortly DHCP

- purpose
- how it works

The Dynamic Host Configuration Protocol (DHCP) is a network protocol that is used to configure network devices so that they can communicate on an IP network. It involves clients and a server operating in a client-server model. In a typical personal home local area network (LAN), a router is the server[1] while clients are personal computers or printers. The router receives this information through a modem from an internet service provider which also operate DHCP servers where the modems are clients. The clients request configuration settings using the DHCP protocol such as an IP address, a default route and one or more DNS server addresses. Once the client implements these settings, the host is able to communicate on that internet. One common effect of DHCP is to separate public (external) and private (internal) IP addresses.

Exam

Compare two approaches of dynamic routing:
distance vector with respect to link-state

Distance-vector

- about the neighbours
- to neighbours
- only distance
- simple
- slow-converging
- periodically

Link-state

- about whole topology
- to all routers
- link state
- complex
- fast-converging
- after changes

Exam

Describe authentication method, where password does not go by a network as a plain text, (e.g. Challenging Handshake Authentication Protocol)

After the completion of the link establishment phase, the authenticator sends a "challenge" message to the peer. The peer responds with a value calculated using a one-way hash function on the challenge and the secret combined. The authenticator checks the response against its own calculation of the expected hash value. If the values match, the authenticator acknowledges the authentication; otherwise it should terminate the connection. At random intervals the authenticator sends a new challenge to the peer and repeats steps 1 through 3.

Exam

Mention 5 reasons that explain: why Ethernet has started to be used in metropolitan and wide area networks.

- Different copper and optical interfaces
- Different speeds: 10, 100 Mb/s, 1, 10, 40, 100 Gb/s
- Different ranges: 15 m - 100 km
 - Half- or full-duplex
- Media sharing possible for interfaces up to 1Gb/s
- SMA/CD
 - collisions
 - back-off
 - retransmissions
 - saturation
- Speed and duplex autoconfiguration possible
- 48-bit flat addressing

Exam

Describe all timers used by TCP.

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Retransmission - TCP counts RTT (max 500ms)

Silence after connection - $2^*TLL \sim 30s$

Persistent - set when window size changes from 0

Live/inactivity

Retransmission timeout:

- Set for every sent segment

- Adaptive algorithm

- $RTT = \alpha * OLD_RTT + (1-\alpha) * NEW_SAMPLE$

- $TIMEOUT = B^*RTT$ (suggested $B=2$)

Exam

What are the reasons of HTTP proxy
deployments ?

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Advantages:

efficiency:

- faster response

- lower bandwidth consumption

- lower server load

security:

- proxy can filter data

- captive portal

others:

- different conversions (eg http://https)

Exam

How can we build a reliable multicast application?

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PGM (Pragmatic General Multicast) In this scheme, multicast packets have sequence numbers and when a packet is missed a recipient can request that the packet be re-multicast with other members of the Multicast group ignoring the replacement data if not needed. An expanded version, PGM-CC, has attempted to make IP Multicasting more "TCP friendly" by stepping the entire group down to the bandwidth available by the worst receiver. Two other schemes are: the standards-track protocol NACK-Oriented Reliable Multicast (NORM) and the protocol File Delivery over Unidirectional Transport (FLUTE). Open-source, in addition to proprietary, implementations exist for these. Such protocols vary in the means of error detection, the mechanisms used in error recovery, the scalability of such recovery and the underlying ideas involved in what it means to be reliable. the lack of a truly scalable Secure Reliable IP Multicast protocol like the proposed Secure Multicast for Advanced Repeating of Television (SMART) have hampered the adoption of IP Multicast in inter-domain routing. Reliable IP Multicasting protocols, such as PGM and SMART, are experimental; the only standard-track protocol is NORM

Exam

Describe TCP, external characteristic and main internal mechanisms.

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connection-oriented, reliable, 20-byte header, complicated, stream flow, congestion control, Connection establishment. To establish a connection, TCP uses a three-way handshake. Before a client attempts to connect with a server, the server must first bind to and listen at a port to open it up for connections: this is called a passive open. Once the passive open is established, a client may initiate an active open Sequence number selection Connection tear-down The connection termination phase uses a four-way handshake, with each side of the connection terminating independently. When an endpoint wishes to stop its half of the connection, it transmits a FIN packet, which the other end acknowledges with an ACK Round-trip estimation the length of time it takes for a signal to be sent plus the length of time it takes for an acknowledgment of that signal to be received. Window flow control TCP uses a sliding window flow control protocol. In each TCP segment, the receiver specifies in the receive window field the amount of additionally received data (in bytes) that it is willing to buffer for the connection. The sending host can send only up to that amount of data before it must wait for an acknowledgment and window update from the receiving host