Appendix C

Memory Tables Answer Key

Chapter 1

TABLE 1-1

Kilobyte, Megabyte, Gigabyte, Terabyte

Term	Size (Bytes)	Size (2^n Bytes)	Rounded Size (Bytes)
Kilobyte	1024	2^{10}	1000
Megabyte	1,048,576	2^{20}	1,000,000
Gigabyte	1,073,741,824	2^{30}	1,000,000,000
Terabyte	1,099,511,627,776	2^{40}	1,000,000,000,000

TABLE 1-2

Unsigned Integers in Computers, Various Sizes

Size of Storage	Number of Bits	Decimal Range	Range, From 0 to $2^n - 1$
Byte	8	0 – 255	$2^8 - 1$
Word	16	0 – 65,535	$2^{16} - 1$
Double word	32	0 – 4,294,967,296	$2^{32} - 1$

TABLE 1-5

Key Comparison Points, USB Flash and Hard Disk Drives

Short Description	Hard Disk	USB Flash Drive	Optical Disc
Internal or external?	Both	External	Both
Removable media?	No	Yes[1]	Yes
Solid state?	No	Yes	No
Read/write speed vs. internal HDD	N/A	Slower	Slower
Price/GB, at publication, vs. HDD	N/A	More expensive	N/A[2]

Chapter 3

TABLE 3-2
TCP/IP Model Summary

Layer Name	Key Functions	Focus: Host or Network	Device Focus
Physical	Physical parts that communicate and energy over those parts (electricity, light, radio)	Network	Cables, radio
Data Link	Rules about when to use physical links; addressing specific to the physical links	Network	LAN switch
Network (Internet)	Logical addressing (addressing independent of the physical links); routing	Network	Router
Transport	Communications functions useful to apps, but likely useful to many apps	Host	Any endpoint device
Application	Communications functions specific to a particular app	Host	Any endpoint device

Chapter 4

TABLE 4-1
Common Features Used by Encoding Schemes

Wave Feature	Definition of the Graph	Electrical Feature It Represents
Amplitude	Maximum height of the curve over the centerline	Voltage
Frequency	The number of complete waves (cycles) per second (in hertz)	Speed with which current alternates directions
Phase	A single location in the repeating wave	Voltage jumps, which make the signal graph jump to a new phase
Period	The time (width on the X axis) for one complete wave to complete	The time for the voltage to change from the maximum positive voltage back to the same point again

TABLE 4-2
SONET Optical Carrier (OC) Names and (Rounded) Line Speeds

Name	(Rounded) Line Speed
OC-1	52 Mbps
OC-3	155 Mbps
OC-12	622 Mbps
OC-24	1244 Mbps

TABLE 4-2
Continued

Name	(Rounded) Line Speed
OC-48	2488 Mbps
OC-96	4976 Mbps
OC-192	9952 Mbps

Chapter 5

TABLE 5-1
Key Original IEEE 802 LAN Standards

Working Group	Common Reference	Purpose
802.2	Logical Link Control	Defines features in common across Ethernet, Token Ring, and others
802.3	Ethernet	Defines features specific to Ethernet
802.5	Token Ring	Defines features specific to Token Ring

TABLE 5-2
Gigabit Ethernet Standards and Cable Lengths

Standard	Shortcut Family Name	Specific Shortcut Name	Year Standardized	Cabling	Maximum Length*
802.3z	1000BASE-X	1000BASE-LX	1998	MM	550 m
802.3z	1000BASE-X	1000BASE-SX	1998	SM	5 km*
802.3ab	1000BASE-T	1000BASE-T	1999	UTP (4 pair)	100 m

TABLE 5-3
Informal Ethernet Names Based on Speeds

Speed	Informal Name	Other Common Informal Names
10 Mbps	Ethernet	—
100 Mbps	Fast Ethernet	Fast E
1 Gbps	Gigabit Ethernet	Gig E, 1 GbE
10 Gbps	10 Gig E	10 GbE
40 Gbps	40 Gig E	40 GbE
100 Gbps	100 Gig E	100 GbE

TABLE 5-5

Ethernet Header and Trailer Fields

Field	Description	Shorthand Reminder
Preamble	7 bytes of repeating binary 10, so that all devices can synchronize at the physical layer.	Get ready…
SFD	Start Frame Delimiter: basically 1 more byte of preamble, but ending with binary 11 instead of 10, to signal that the destination address follows next.	…last byte before addresses!
Destination MAC Address	The 6-byte address that identifies the Ethernet device to which this frame should be delivered.	To there
Source MAC Address	The 6-byte address that identifies the sending node.	From here
Type	A 2-byte code that identifies the type of data in the data field; often refers to an IPv4 packet today.	The type of data
Data	The data from Ethernet's perspective that includes all headers from upper layers, plus user data.	The actual data
Pad	Extra bytes used to lengthen short frames so that they meet the minimum frame length requirements.	Shortie
FCS	Frame Check Sequence. A field used to determine whether any bits changed during transmission. If so, the receiver should discard the frame.	Check for errors

Chapter 6

TABLE 6-2

Comparing 802.3 Wired LANs with 802.11 Wireless LANs

Topic	Wired	Wireless
Uses cables.	Yes	No
UTP cable distance/wireless range is defined by the standard and not significantly affected by local site conditions.	Yes	No
A single LAN standard specifies a single speed, rather than a set of allowed speeds.	Yes	No
Allows full duplex on each link, rather than sharing bandwidth among all devices using half duplex.	Yes	No

TABLE 6-3
Comparisons of Wireless LAN Topologies

Feature	IBSS (Ad Hoc)	BSS	ESS
Number of APs used	0	1	>1
Data frame flow	Device to device	Device to AP	Device to AP
Connects clients to some other network?	No	Yes	Yes
Allows roaming?	No	No	Yes

TABLE 6-4
Summary of 802.11 Standards and Differences

	802.11a	802.11b	802.11g	802.11n	802.11n[1]
Year ratified	1999	1999	2003	2009	2009
Channel width (MHz)	20	22	22	20	40
Encoding class	OFDM	DSSS	DSSS	OFDM	OFDM
Frequency band (ISM at 2.4 GHz, UNII at 5 GHz)	UNII	ISM	ISM	Both	Both
Nonoverlapping channels, USA (FCC)	23	3	3	21[2]	9[2]
Maximum bit rate, one stream (Mbps)	54	11	54	72	150
Supports up to four streams on one device[2]	No	No	No	Yes	Yes

Chapter 7

TABLE 7-4
HDLC Header and Trailer Fields

Field	Description	Shorthand Reminder	Similar to Ethernet…
Flag	1-byte (7E) that a frame is beginning.	Here comes the frame!	Preamble + SFD
Address	Identifies the destination device; typically FF (“all stations”) between routers, which works well on the point-to-point topology.	To there	Destination MAC
Control	Defines many subfields used by older devices in decades past.	Old; ignore	N/A
Data	The data, including all headers from upper layers, plus user data.	The actual data	Data
FCS	Frame Check Sequence. A field used to determine whether any bits changed during transmission. If so, the receiver should discard the frame.	Check for errors	FCS

Chapter 8

TABLE 8-1

Other TCP/IP Network Layer Protocols

Short Name	Full Name	Comments
ICMP	Internet Control Message Protocol	Messages that hosts and routers use to manage and control the packet-forwarding process; used by the **ping** command.
ARP	Address Resolution Protocol	Used by LAN hosts to dynamically learn another LAN host's MAC address.
DHCP	Dynamic Host Configuration Protocol	Used by a host to dynamically learn an IP address (and other information) it can use.
DNS	Domain Name System	A protocol by which user hosts can use names, with a DNS server translating the name into a corresponding IP address, which is needed by the IP routing process.
RIP	Routing Information Protocol	An application that runs on routers so that routers dynamically learn IP routing tables, needed so that they can route IP packets correctly. An open routing protocol, defined in an RFC.
EIGRP	Enhanced Interior Gateway Routing Protocol	A proprietary routing protocol whose rights are owned by Cisco Systems.
OSPF	Open Shortest Path First	An open routing protocol, defined in an RFC.

TABLE 8-2

Summary of IPv4 Address Classes Based on First-Octet Values

First Octet	Class	Purpose
0	A	Reserved
1 – 126	A	Unicast addresses, in class A networks
127	A	Reserved
128 – 191	B	Unicast addresses, in class B networks
192 – 223	C	Unicast addresses, in class C networks
224 – 239	D	Multicast addresses. Not used as unicast IP addresses
240 – 255	E	Experimental. Not used as unicast IP addresses

TABLE 8-3

Example Class A Networks

Network ID	Class A IP Network Concept	Size (Number of Addresses)
1.0.0.0	All addresses with a first octet equal to 1	> 16,000,000
2.0.0.0	All addresses with a first octet equal to 2	> 16,000,000
3.0.0.0	All addresses with a first octet equal to 3	> 16,000,000
4.0.0.0	All addresses with a first octet equal to 4	> 16,000,000
…	Skipping many…	> 16,000,000
126.0.0.0	All addresses with a first octet equal to 126	> 16,000,000

TABLE 8-4

Example Class B Networks

Network ID	Concept	Size (Number of Addresses)
128.1.0.0	All with the first two octets equal to 128.1	> 65,000
128.2.0.0	All with the first two octets equal to 128.2	> 65,000
128.3.0.0	All with the first two octets equal to 128.3	> 65,000
150.48.0.0	All with the first two octets equal to 150.48	> 65,000
180.255.0.0	All with the first two octets equal to 180.255	> 65,000
191.200.0.0	All with the first two octets equal to 191.200	> 65,000

TABLE 8-5

Example Class C Networks

Network ID	Concept	Size (Number of Addresses)
192.1.1.0	All with the first three octets equal to 192.1.1	254
192.1.2.0	All with the first three octets equal to 192.1.2	254
192.1.3.0	All with the first three octets equal to 192.1.3	254
200.200.200.0	All with the first three octets equal to 200.200.200	254
220.255.0.0	All with the first three octets equal to 220.255.0	254
223.1.1.0	All with the first three octets equal to 123.1.1	254

TABLE 8-7

Summary of IPv4 Address Classes Based on First-Octet Values

Class	First-Octet Values	Number of Network Octets	Grouping Concept
A	1 – 126	1	All addresses that begin with the same first octet
B	128 – 191	2	All addresses that begin with the same first two octets
C	192 – 223	3	All addresses that begin with the same first three octets

Chapter 9

TABLE 9-3

Internet Access Link Comparison Points

Name	Analog Circuit	DSL	Cable
Physical link	Telco local loop	Telco local loop	CATV cable
Always on?	No	Yes	Yes
Allows voice at the same time over the same medium?	No	Yes	Yes
Asymmetric? (Faster downlink possible)	No	Yes	Yes
Approximate real-life downlink speeds	56 Kbps	24 Mbps	50 Mbps

TABLE 9-4

Regional Internet Registries (RIR)

Name	Locations Served
AfriNIC	Africa
APNIC	Asia Pacific
ARIN	North America
LACNIC	Latin America, Caribbean
RIPE NCC	Europe, Middle East, Central Asia

TABLE 9-5

Number and Sizes of Classful IP Networks

Class	Number of Networks	Size (Number of Host Addresses)
A	126	$2^{24} - 2$ (>16,000,000)
B	16,384	$2^{16} - 2$ (>65,000)
C	2,097,192	$2^{8} - 2$ (254)

TABLE 9-6

Private IP Networks

Class	Number of Networks	Network IDs
A	1	10.0.0.0
B	16	172.16.0.0 – 172.31.0.0
C	256	All that begin with 192.168 (192.168.0.0, 192.168.1.0, 192.168.2.0, and so on, through 192.168.255.0)

Chapter 10

TABLE 10-1

Common Application Protocols and Their Well-Known Port Numbers

Application Protocol	Transport Protocol	Port Number	Description
HTTP	TCP	80	Used by web browsers and web servers
Telnet	TCP	23	Used for terminal emulation
SSH	TCP	22	Used for secure terminal emulation
FTP	TCP	20, 21	Used for file transfer
DNS	UDP	53	Used for name resolution
SMTP	TCP	25	Used to send and receive email
POP3	TCP	110	Another email protocol
IMAP	TCP	143	Another email protocol
SSL	TCP	443	Used to encrypt data for secure transactions
SNMP	UDP	161, 162	Used to manage TCP/IP networks

TABLE 10-3
TCP and UDP Comparisons

Feature	TCP	UDP
Delivering data between two applications	Yes	Yes
Identifying servers using well-known ports	Yes	Yes
Segmenting data	Yes	No
Guaranteed delivery through error recovery	Yes	No
In-order delivery	Yes	No
Flow control	Yes	No