

Table of Contents

1	The Ethernet	1
	Introduction	1
1.1	Fundamentals	2
1.2	ALOHA Model	3
1.3	Manchester Encoding	4
1.4	IEEE Standards	5
1.4.1	PLS (Physical Layer Signaling)	9
1.4.2	The PMA	11
1.4.3	The AUI	12
1.4.4	The MAU	14
1.4.5	The MDI	14
1.5	CSMA/CD	15
1.5.1	Early Collision	17
1.5.2	Late Collision	18
1.5.3	CSMA/CD Operation: Preamble and SFD Transmission	19
1.5.4	Back-off Algorithm	21
1.5.5	Inter-Packet Gap	22
1.5.6	Round Trip Delay	23
1.6	The MAC	28
1.6.1	Transmit and Receive Data Encapsulation	29
1.6.2	Access Management	31
1.7	Frame Structure	31
1.8	Ethernet Components	42
1.8.1	NIC	42
1.8.2	Ethernet in Action	44
1.9	Interconnection Devices	46
1.9.1	Repeater	47
1.9.2	Bridge	48
1.9.3	Switch	50
1.9.4	Router	51
1.9.5	Gateway	51
1.10	Structured Cabling System	53
1.10.1	The Definition	54
1.10.2	The Subsystems	56
1.10.3	Effects of Wire Characteristics	61
1.10.4	UTP Wiring Concept	68
1.11	The Shared-media Ethernet LAN	73
1.11.1	10 Base-5 (Thick Coax)	74

1.11.2	10 Base-2 (Thin Coax).....	75
1.11.3	10 Base-T (TP)	76
2	Basics of LAN Switching	81
	Introduction	81
2.1	Switching: A technology overview	81
2.1.1	Stackable Switches	84
2.1.2	Modular Switches	87
2.2	Switching Basics	89
2.2.1	Configuration switching	90
2.2.2	Cell Switching	90
2.2.3	Frame Switching (Layer 2).....	91
2.2.4	Switch performance	95
2.2.5	Latency	95
2.2.6	Throughput	96
2.2.7	Congestion Control.....	96
2.3	Architecture and Design Concept	97
2.3.1	Buffering.....	97
2.3.2	Address Resolution.....	98
2.4	The Design	99
2.4.1	Cross-bar Switch.....	99
2.4.2	Shared-memory Switch	101
2.4.3	Shared Bus	103
2.4.4	Functional Model.....	103
2.5	Selecting a Switch	104
2.5.1	Buffering.....	105
2.5.2	Packet Drop	105
2.5.3	Latency	105
2.5.4	Bandwidth and configuration flexibility.....	106
2.5.5	Remote monitoring capability	106
2.6	Switch Features	106
2.6.1	Auto-sensing (Auto-negotiation).....	107
2.6.2	Spanning Tree Protocol	110
2.7	VLAN.....	129
2.7.1	Virtual Organization	129
2.7.2	Resource Management	129
2.7.3	Bandwidth Efficiency	130
2.7.4	Security	131
2.7.5	VLAN Basics.....	131
2.8	MLT.....	139
2.9	IP Multicast	144
2.10	Traffic Class and Dynamic Filtering Service.....	150
2.10.1	Group MAC Address	151
2.10.2	Port Filtering Mode.....	151
2.10.3	VLAN	152
2.10.4	GMRP	152

2.10.5	GARP PDU	153
2.10.6	The IEEE 802.1p definition	153
2.11	Simple Network Management Protocol	159
2.11.1	Managed Node	160
2.11.2	Network Management Station	160
2.11.3	Managed object	160
2.11.4	MIB	160
2.11.5	Structure of Management Information	160
2.11.6	SNMP operation	160
2.12	RMON	163
2.12.1	RMON I MIB Groups	163
3	Trends of Ethernet	167
	Introduction	167
3.1	Asynchronous versus Synchronous Ethernet	168
3.2	Fast Ethernet	170
3.3	Layered Architecture	172
3.3.1	The Reconciliation Sublayer (RS)	172
3.3.2	MII	174
3.3.3	Physical Coding Sublayer	178
3.3.4	Physical Medium Attachment (PMA)	179
3.3.5	PMD sublayer	179
3.4	Encoding	179
3.4.1	NRZI (Non-Return To Zero Inverted)	181
3.4.2	MLT-3	182
3.5	100 Base-T4	183
3.5.1	The PCS transmit and receive Function	187
3.5.2	PMA sublayer	191
3.5.3	MDI connector	192
3.6	100 Base-T2	194
3.6.1	100 Base-T2 Operation	195
3.6.2	100 Base-T2 PCS	196
3.6.3	PMA Sublayer	197
3.6.4	PHY	197
3.6.5	Delay factors	198
3.7	The 100 Base-X Transceiver	198
3.7.1	100 Base-X PHY encapsulation	201
3.7.2	The 100 Base-X PCS sublayer	201
3.7.3	100 Base-TX	203
3.7.4	100 Base-FX	207
3.8	The 100 Base-T network system	211
3.9	Gigabit Ethernet	213
3.9.1	Physical Coding Sublayer (PCS)	219
3.9.2	The PMA sublayer	221
3.9.3	The PMD sublayer	222
3.9.4	The GbE MAC	225
3.10	1000 Base-LX GbE	226

3.11	1000 Base-SX.....	227
3.12	1000 Base-CX	228
3.13	GbE over Copper (1000 Base-T)	231
3.13.1	Layered Architecture	233
3.13.2	Delay Constraints.....	237
3.13.3	Noise Environment	237
3.13.4	Auto-negotiation	238
3.13.5	1000 Base-T cabling Considerations	240
3.14	GbE Topology and Cabling.....	241
4	Token Ring	245
	Introduction	245
4.1	Architecture	246
4.2	TR Basics	247
4.2.1	Differential Manchester Encoding.....	248
4.3	Symbol Transmission	248
4.4	The PSC Sublayer	251
4.4.1	Implementation of service primitives	252
4.5	The PMC Sublayer	255
4.6	The concentrator.....	256
4.6.1	Concentrator Lobe Port	259
4.6.2	Trunk Port.....	261
4.6.3	Active Retiming Concentrator (ARC).....	262
4.6.4	Dual-ring and Wrapback Reconfiguration	263
4.7	TR Bridging/Switching	267
4.7.1	SRB/SRS.....	269
4.8	The concept	269
4.8.1	Token	269
4.9	Frame Structure	273
4.9.1	Frame Control (FC)	273
4.9.2	LLC Frame.....	276
4.9.3	DA and SA Fields.....	279
4.9.4	The RI field.....	281
4.9.5	Frame Check Sequence (FCS).....	283
4.9.6	Frame Status	283
4.9.7	The IFG.....	284
4.10	TR operation.....	284
4.10.1	TR error Condition	287
4.10.2	Soft Error	295
4.10.3	Active Retiming Concentrator (ARC).....	296
4.11	Dedicated TR.....	296
4.11.1	DTR concentrator	297
4.11.2	Port State Database.....	302
4.11.3	Filtering Database.....	302
4.11.4	Destination Route Descriptor (DRD)	302

4.12	DTR Frame Format	304
4.12.1	Access Control (AC).....	304
4.12.2	Functional Addresses.....	305
4.12.3	Ending Delimiter	305
4.12.4	Frame Status	305
4.12.5	The DTR MAC Frames	306
4.12.6	TXI Access Protocol Definition	306
4.13	Fast TR	306
4.13.1	Frame Structure	307
4.13.2	MAC frame.....	310
4.14	Gigabit TR.....	310
5	Wireless LAN	311
	Introduction	311
5.1	Modulation	311
5.1.1	Amplitude Modulation.....	312
5.1.2	Frequency Modulation.....	312
5.1.3	Phase Modulation	312
5.2	Digital Modulation	313
5.2.1	Phase Shift Keying (PSK)	314
5.2.2	Frequency Shift Keying (FSK).....	314
5.2.3	Amplitude Shift Keying (ASK)	314
5.3	Basics of WLAN	316
5.3.1	Overview.....	317
5.4	Layered Architecture	321
5.4.1	Spread Spectrum (SS).....	322
5.4.2	FHSS.....	323
5.4.3	DSSS.....	328
5.4.4	Basic Access Protocols	332
5.4.5	Synchronization	346
5.4.6	AP operation	349
5.5	Frame Structure	350
5.5.1	Frame Control (FC)	350
5.5.2	Duration/ID.....	353
5.5.3	Address Fields	354
5.5.4	Sequence Control.....	355
5.5.5	Frame Body	355
5.5.6	FCS	355
5.6	IR PHY	356
5.6.1	PLCP Transmit and Receive procedure.....	358
5.6.2	IR PMD sublayer	360
5.7	Planning for WLAN	362
5.7.1	Product Requirements.....	362

6	IP Internetworking	365
	Introduction	365
6.1	Layer 3 Switch	365
6.2	IP Addressing	367
6.2.1	Subnetting	368
6.2.2	Variable Length Subnet Mask	373
6.2.3	Classless Interdomain Routing	375
6.3	Routing	379
6.3.1	Routing Tables	380
6.3.2	Routing Protocols	382
6.3.3	OSPF Protocol	389
6.4	VoIP Overview	411
6.4.1	Layered Architecture	412
6.5	IP QoS	429
6.5.1	First-in, First-out (FIFO)	431
6.5.2	Weighted Fair Queuing (WFQ)	432
6.5.3	Custom Queuing (CQ)	434
6.5.4	Priority Queuing (PQ)	435
6.5.5	IP Datagram	436
6.5.6	Integrated Service	449
6.5.7	Differentiated Service (DiffServ)	459
	Bibliography	469
	Index	473



<http://www.springer.com/978-3-540-66597-7>

High Speed LAN Technology Handbook

Chowdhury, D.D.

2000, XIV, 497 p., Hardcover

ISBN: 978-3-540-66597-7