Domain 4: Network and Communication Security		Common TCP Protocols				CISSP Cheat Sheet Series comparitech	
OSI Reference Model 7 layers, Allow changes between layers, Standard hardware/software interoperability.		Port Protocol 20,21 FTP			IP Addresses		Port Ranges
7 layers, Allow changes between layers, Standard hardware/software interoperability. Tip, OSI Mnemonics All People Seem To Need Data Processing		22 23	SSH TELNET	Public IPv4 address space	• Class A: 0.0.0.0 - 127.255.255.255 • Class B: 128.0.0.0 - 191.255.255.255	Authentication methods: • PAP=Clear text, unencrypted	
All People Seem To Need Data Processing Please Do Not Throw Sausage Pizza Away Layer Data Security		25	SMTP DNS	Private IPv4	• Class C: 192.0.0.0 – 223.255.255 • Class A: 10.0.0.0 – 10.255.255.255	• CHAP=unencrypted, encrypted • MS-CHAP=encrypted, encrypted	
Layer Application	-	53 110	POP3	address space	• Class C: 192.168.0.0 - 192.168.255.255	Challenge-Handshake Authent Protocol (CHAP)	tication Encrypt username/password and re-authenticate periodically. Use in PPP.
Presentation Session	Data C, AU, Encryption Data N	80 143	HTTP IMAP	Subnet Masks	 Class A: 255.0.0.0 Class B: 255.255.0.0 Class C: 255.255.255.0 	Layer 2 Tunneling Protocol (L	` ,
Transport	Segment C, AU, I	389 443	LDAP HTTPS	IPv4	32 bit octets	Authentication Header (Al	Provide authentication and integrity, no confidentiality.
Network Data link	Packets C, AU, I Frames C	636 445	Secure LDAP ACTIVE DIRECTORY	IPv6	128 bit hexadecimal Network Types	Encapsulating Security Payload	` '
Physical Bits C C=Confidentiality, AU=Authentication, I=Integrity, N=Non repudiation Lordware /		1433 Microsoft SQL 3389 RDP		Local Area	Geographic Distance and are is limited to one	Security Associations (SA	network entities.
Layer (No) Functions Protocols Hardware / Formats		137-139 NETBIOS		Network (LAN) building. Usually connect using copper wire or fiber optics		Transport Mode Tunnel Mode	Payload is protected. IP payload and IP header are protected.
Physical (1) Electrical sign			in OSI layers	Campus Area Network (CAN)	Multiple buildings connected over fiber or wireless	Internet Key Exchange (IK Remote Authentication Dial-In Us	
Bits to voltage	Repeaters, ATM	Layer	Attack Phishing - Worms -	Metropolitan Area Network	Metropolitan network span within cities	(RADIUS) SNMP v3	authentication with cleartext. Encrypts the passwords.
Frames setup Error detection and control Data Link Check integrity of packets PPP - PPTP - L2TP ARP - RARP - SNAP - CHAP - LCP - Layer 2		Application Trojans Phishing - Worms -		(MAN) Wide Area	Interconnect LANs over large geographic area	Dynamic Ports 49152 - 65535	
Layer (2) Check integrity of packets Layer (2) Destination address, Frames Use in MAC to IP address MLP - Frame Relay - HDLC - Switch - bridges		Presentation Trojans Session Session hijack		network (WAN) Intranet	A private internal network	Remote Access Services	
use in MAC to IP address conversion. Ring - FDDI		Transport	SYN flood - fraggle smurfing flooding -	Extranet	connects external authorized persons access to intranet	Telnet Remote login (rlogin)	Username /Password authentication. No encryption. No password protection.
segmentation,	, logical BOOTP - DHCP - ICMP Switch -	Network	ICMP spoofing - DOS	Internet	Public network orking Mothode & Standards	SSH (Secure Shell) Terminal Access Controller	Secure telnet User credentials are stored in a server known as a
addressing. A	TCP - UDP datagrams. Router Routers -	Data link	Collision - DOS /DDOS - Eavesdropping	Software	Orking Methods & Standards Decoupling the network control and the	Access-Control System (TACACS)	TACACS server. User authentication requests are handled by this server.
Transport Segment - Connection oriented Segment - Connection transfer - Segmentation - seguencing -		Physical	Signal Jamming - Wiretapping	defined networking	forwarding functions. Features -Agility, Central management,	TACACS+	More advanced version of TACACS. Use two factor authentication.
Segmentation - sequencing - and error checking TCP - LIDP - NSE - SOL -		Hardw	vare Devices	(SDN) Converged	Programmatic configuration, Vendor neutrality. Transfer voice, data, video, images, over single	Remote Authentication Dial-In User Service (RADIUS)	Client/server protocol use to enable AAA services for remote access servers.
Session Layer Data, simplex, half duplex, full dupl Eg. peer connections. TCP - UDP - NSF - SQL - RADIUS - and RPC - PPTP - PPP Gateways		НИВ	Layer 1 device forward frames via all ports	protocols for media transfer	network		Secure and encrypted communication channel between two networks or between a user and a
Presentation Data Gateways		Modem	digital to analog conversion	Fibre Channel over Ethernet	Running fiber over Ethernet network.	Virtual private network (VPN)	network. Use NAT for IP address conversion. Secured with strong encryptions such as L2TP or IPSEC.
layer compression/decompression and encryption/decryption TCP - UDP messages JPEG - TIFF - MID - HTML		Routers Bridge	Interconnect networks Interconnect networks in	(FCoE) Multiprotocol	Transfer data based on the short path labels	\/DNI	J ,,
Application Data	TCP - UDP - FTP - TELNET - TFTP - SMTP - HTTP CDP - GATE CNAP NATE CSI	Ethernet Inhound/outhound data		Label Switching	instead of the network IP addresses. No need of route table lookups.	VPN encryption options • PPP for authentication	
layer	SMB - SNMP - NNTP - SSL - HTTP/HTTPS.	Gateways	entry points for networks Frame forward in local	(MPLS) Internet Small	Standard for connecting data storage sites such	Point-to-Point Tunneling Protocol	
	TCP/IP Model	Switch	network. Share network traffic	Computer Interface (ISCI)		(PPTP)	Connection setup uses plaintext Data link layer Single connection per acceion
Layers Action Example Protocols Token ring • Frame Relay • EDDI		Load balancers	load by distributing traffic between two	Multilayer Protocols	Encryption and different protocols at different levels. Disadvantages are hiding coveted channels	Layer 2 Tunneling Protocol (L2TP)	Single connection per session Same as PPTP except more secure
	• Ethernet • X.25		devices Hide internal public IP	Voice over	and weak encryptions. Allows voice signals to be transferred over the	.,a.momig i Totocol (LZTF	Network layer
Internet datag	grams to be transferred via network access layer	Proxies	address from external public internet	Internet Protocol (VoIP)	nublic Internet connection	Internet Protocol Security (IPsec)	• Encryption and authentication
Transport Flo	ow control and integrity TCP • UDP Telnet • SSH • DNS • HTTP • FTP		/Connection caching and filtering.	Asynchronous transfer mode	bandwidth. Uses 53-byte fixed size cells. Un	Communic	· Confidentiality and integrity cation Hardware Devices
Application	format • SNMP • DHCP	VDN LYPY	Use to create VPN or aggregate VPN	(ATM)	demand bandwidth allocation. Use fiber optics. Popular among ISPs	Concentrator Divides connec	cted devices into one input signal for transmission over
TO	CP 3-way Handshake	VPNs and VPN concentrators	connections provide using different internet	X25	PTP connection between Data terminal equipment (DTE) and data circuit-terminating equipment	one output via i	network. Itiple signals into one signal for transmission.
SYN - SYN/ACK - ACK LAN Topologies		links Capture or monitor			(DCE) Use with ISDN interfaces. Faster and use multiple	Hubs Retransmit sign Repeater Amplifies signa	nal received from one port to all ports. al strength.
Topology	Pros Cons	Protocol analyzers	· '	Frame Relay	PVCs, provides CIR. Higher performance. Need to have DTE/DCE at each connection point. Perform		Transmission Types
BUS	No redundancySimple to setupSingle point of failure	Unified threat	New generation vulnerability scanning	Synchronous	error correction. IBM proprietary protocol use with permanent	Circuit-switched • Dedicate	ed permanent circuits or communication paths required.
	Difficult to troubleshoot No middle point	management	application Create collision	Data Link Control (SDLC)	dedicated leased lines	networks • Stable sp	speed. Delay sensitive. used by ISPs for telephony.
RING	radit tolerance two two times to the transfer		Orcate combion			•	
RING Start	• Fault tolerance • Single point of failure	VLANs	domains. Routers separate broadcast	High-level Data Link Control	Use DTE/DCE communications. Extended	• Fixed siz Packet-switched bandwidth	ze packets are sending between nodes and share th.
	·		domains. Routers	High-level Data Link Control (HDLC) Domain name	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address	• Fixed siz Packet-switched bandwidth networks • Delay ser	ze packets are sending between nodes and share th.
Start Mesh Types of D	 Fault tolerance Fault tolerance Redundant Expensive to setup Digital Subscriber Lines (DSL)	IDS/IPS	domains. Routers separate broadcast domains Intrusion detection and prevention.	High-level Data Link Control (HDLC) Domain name	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa.	Packet-switched networks • Fixed siz bandwidth • Delay ser • Use virtu	ze packets are sending between nodes and share th. ensitive. ual circuits therefore less expensive. reless Networking
Start Mesh Types of D Asymmetric Digital • Dov • Max	• Fault tolerance • Fault tolerance • Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) wnload speed higher than upload ximum 5500 meters distance via telephone lines.	Firewall a	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter	High-level Data Link Control (HDLC) Domain name	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address	Packet-switched networks • Fixed siz bandwidth • Delay ser • Use virtu	ze packets are sending between nodes and share th. ensitive. ual circuits therefore less expensive.
Start Mesh Types of D Asymmetric Digital • Dov Subscriber Line (ADSL) • Max (ADSL) • Max Rate Adaptive DSL • Uple	• Fault tolerance • Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) whole which is a speed higher than upload ximum 5500 meters distance via telephone lines. ximum download 8Mbps, upload 800Kbps. load speed adjust based on quality of the transmission line	Firewall a	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter security	High-level Data Link Control (HDLC) Domain name system (DNS)	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines	Packet-switched networks • Fixed siz bandwidth • Delay ser • Use virtu Wireless person	ze packets are sending between nodes and share th. ensitive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards
Start Mesh Types of D Asymmetric Digital • Dov • Max • Symmetric Digital • San	• Fault tolerance • Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) whole a speed higher than upload ximum 5500 meters distance via telephone lines. ximum download 8Mbps, upload 800Kbps. load speed adjust based on quality of the transmission line ximum 7Mbps download, 1Mbps upload over 5500 meters. me rate for upstream and downstream transmission rates.	Firewall a S DMZ (Demilitarized extension	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL	Packet-switched networks • Fixed siz bandwidth • Delay ser • Use virtu Wireless person IEEE 802.15 IEEE 802.3	ze packets are sending between nodes and share th. ensitive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE
Start Mesh Types of C Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Start Dov Max Max Place Subscriber Line (SDSL) Max Place Max Max Max Max Max Max Max Max	• Fault tolerance • Fault tolerance • Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) whole of the setup stance via telephone lines. ximum 5500 meters distance via telephone lines. ximum download 8Mbps, upload 800Kbps. load speed adjust based on quality of the transmission line ximum 7Mbps download, 1Mbps upload over 5500 meters. me rate for upstream and downstream transmission rates. tance 6700 meters via copper telephone cables ximum 2.3Mbps download, 2.3Mbps upload.	IDS/IPS Firewall a S DMZ (Demilitarized zone) Bastion Host - Dual	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter ecurity cure network between ternal internet facing and ternal networks. al-Homed - Three-Legged -	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL ed 1024-49151 nnel 64 Kbps	Packet-switched networks • Fixed siz bandwidth • Delay ser • Use virtu Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.11	ze packets are sending between nodes and share th. ensitive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi
Start Mesh Types of C Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) High	• Fault tolerance • Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) whoload speed higher than upload ximum 5500 meters distance via telephone lines. ximum download 8Mbps, upload 800Kbps. load speed adjust based on quality of the transmission line ximum 7Mbps download, 1Mbps upload over 5500 meters. me rate for upstream and downstream transmission rates. tance 6700 meters via copper telephone cables ximum 2.3Mbps download, 2.3Mbps upload. There speeds than standard ADSL ximum 52Mbps download, 16 Mbps upload up to 1200	IDS/IPS Firewall a S DMZ (Demilitarized zone) Bastion Host - Dual Screened Subnet -	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter ecurity cure network between ternal internet facing and ternal networks.	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL ed 1024-49151 nnel 64 Kbps nnel 16 Kbps	Packet-switched networks • Fixed siz bandwidth • Delay ser • Use virtu Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.21 IEEE 802.20	ze packets are sending between nodes and share th. ensitive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi
Types of D Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) High-bit-rate DSL T1 sr	• Fault tolerance • Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) whoload speed higher than upload ximum 5500 meters distance via telephone lines. ximum download 8Mbps, upload 800Kbps. load speed adjust based on quality of the transmission line ximum 7Mbps download, 1Mbps upload over 5500 meters. me rate for upstream and downstream transmission rates. tance 6700 meters via copper telephone cables ximum 2.3Mbps download, 2.3Mbps upload. There speeds than standard ADSL ximum 52Mbps download, 16 Mbps upload up to 1200	IDS/IPS Firewall a S DMZ (Demilitarized zone) Bastion Host - Dual Screened Subnet -	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter ecurity cure network between ternal internet facing and ernal networks. al-Homed - Three-Legged - Proxy Server - PBX - Honey ot - IDS/IPS	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL ed 1024-49151 nnel 64 Kbps nnel 16 Kbps annels 64 Kbps	Packet-switched networks • Fixed siz bandwidth • Delay ser • Use virtu Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.11 IEEE 802.20 Standard 802.11a	ze packets are sending between nodes and share th. ensitive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed Frequency (GHz) 54 Mbps 5
Types of D Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) High-bit-rate DSL (HDSL) Committed T1 sp	• Fault tolerance • Fault tolerance • Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) whole of the setup strain	IDS/IPS Firewall a S DMZ (Demilitarized zone) Bastion Host - Dua Screened Subnet - Po Virus	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter ecurity cure network between ternal internet facing and ernal networks. al-Homed - Three-Legged - Proxy Server - PBX - Honey ot - IDS/IPS No Malicious software,	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL ed 1024-49151 nnel 64 Kbps nnel 16 Kbps annels 64 Kbps	Packet-switched networks Packet-switched networks Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.11 IEEE 802.20 Standard 802.11a 802.11b 802.11g 802.11n 802.11ac	ze packets are sending between nodes and share th. ensitive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed Frequency (GHz) 54 Mbps 5 11 Mbps 2.4 54 Mbps 2.4 200+ Mbps 2.4 200+ Mbps 5 1Gbps 5
Types of D Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) High-bit-rate DSL (HDSL) Committed Information Rate (CIR)	• Fault tolerance • Fault tolerance • Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) whole of the set of the	IDS/IPS Firewall a S DMZ Sec extended a second control of the se	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter ecurity cure network between ternal internet facing and ernal networks. Ial-Homed - Three-Legged - Proxy Server - PBX - Honey ot - IDS/IPS No Malicious software, Self propagating vir b Time or condition lo	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha etwork Atta e, code and executa ruses ocked virus	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL ed 1024-49151 nnel 64 Kbps nnel 16 Kbps annels 64 Kbps acks tables	Packet-switched networks Packet-switched networks Packet-switched networks Packet-switched networks Packet-switched networks Packet-switched bandwidth Delay set Use virtu Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.11 IEEE 802.20 Standard 802.11a 802.11b 802.11g 802.11n 802.11ac Packet-switched bandwidth Packet-switched	ze packets are sending between nodes and share th. ensitive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed Frequency (GHz) 54 Mbps 5 11 Mbps 2.4 54 Mbps 2.4 200+ Mbps 2.4 200+ Mbps 5 1Gbps 5 as DSSS or FHSS
Types of D Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) High-bit-rate DSL (HDSL) Committed Information Rate (CIR) Types of D • Dov • Max • Max • Dist • Max • Dist • Max • Dist • Max • Dist • Max • T1 sp Committed Information Rate (CIR)	• Fault tolerance • Fault tolerance • Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) wnload speed higher than upload ximum 5500 meters distance via telephone lines. ximum download 8Mbps, upload 800Kbps. load speed adjust based on quality of the transmission line ximum 7Mbps download, 1Mbps upload over 5500 meters. me rate for upstream and downstream transmission rates. tance 6700 meters via copper telephone cables ximum 2.3Mbps download, 2.3Mbps upload. There speeds than standard ADSL ximum 52Mbps download, 16 Mbps upload up to 1200 ers peed for two copper cables for 3650 meters	IDS/IPS Firewall a Solution of Solution Host - Dua Screened Subnet - Position Worms Logic Bombon Trojan	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter ecurity cure network between ternal internet facing and ernal networks. al-Homed - Three-Legged - Proxy Server - PBX - Honey ot - IDS/IPS No Malicious software, Self propagating vir b Time or condition lo Code and/or execut malicious	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha PRI B & D cha etwork Atta e, code and executa ruses ocked virus utables that act as I	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL ed 1024-49151 nnel 64 Kbps nnel 16 Kbps annels 64 Kbps	Packet-switched networks Packet-switched networks Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.11 IEEE 802.20 Standard 802.11a 802.11b 802.11g 802.11n 802.11ac • 802.11 use CSMA/CA protocol access only DSSS Wireless person Wireless person IEEE 802.20 Standard 802.11b 802.11b 802.11c • 802.11b 802.11c • 802.11 use CSMA/CA protocol access only DSSS Wireless Direct Color of the Co	ze packets are sending between nodes and share th. ensitive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed Frequency (GHz) 54 Mbps 5 11 Mbps 2.4 54 Mbps 2.4 200+ Mbps 2.4 & 5 1Gbps 5 as DSSS or FHSS rectly connects peer-to-peer mode clients without a
Types of D Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) High-bit-rate DSL (HDSL) Committed Information Rate (CIR) Unicast Multicast	• Fault tolerance • Fault tolerance • Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) whoload speed higher than upload ximum 5500 meters distance via telephone lines. ximum download 8Mbps, upload 800Kbps. load speed adjust based on quality of the transmission line ximum 7Mbps download, 1Mbps upload over 5500 meters. The rate for upstream and downstream transmission rates. Itance 6700 meters via copper telephone cables ximum 2.3Mbps download, 2.3Mbps upload. Ther speeds than standard ADSL ximum 52Mbps download, 16 Mbps upload up to 1200 Theres The peed for two copper cables for 3650 meters The peed for two copper cables for 3650 meters The peed for two copper cables for 3650 meters The peed for two copper cables for 3650 meters The peed for two copper cables for 3650 meters The peed for two copper cables for 3650 meters	IDS/IPS Firewall a S DMZ (Demilitarized zone) Bastion Host - Dual Screened Subnet - Po Virus Worms Logic Bomb	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter ecurity cure network between ternal internet facing and ernal networks. Tal-Homed - Three-Legged - Proxy Server - PBX - Honey ot - IDS/IPS No Malicious software, Self propagating vir b Time or condition to Code and/or execut malicious Unauthorized code Slicing A series of small at	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha PRI B & D cha etwork Atta e, code and executa fruses locked virus stables that act as I	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL ed 1024-49151 nnel 64 Kbps nnel 16 Kbps annels 64 Kbps acks tables	Packet-switched networks Packet-switched networks Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.11 IEEE 802.20 Standard 802.11a 802.11b 802.11g 802.11n 802.11ac • 802.11 use CSMA/CA protocol acceptable should be supported by the second of the seco	ze packets are sending between nodes and share th. ensitive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed Frequency (GHz) 54 Mbps 5 11 Mbps 2.4 54 Mbps 2.4 200+ Mbps 2.4 & 5 1 Gbps 5 as DSSS or FHSS eless Security Protocols
Types of D Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) High-bit-rate DSL (HDSL) Committed Information Rate (CIR) Unicast Multicast Broadcast Carrier-sense Multiple	• Fault tolerance • Fault tolerance • Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) whoload speed higher than upload ximum 5500 meters distance via telephone lines. ximum download 8Mbps, upload 800Kbps. load speed adjust based on quality of the transmission line ximum 7Mbps download, 1Mbps upload over 5500 meters. me rate for upstream and downstream transmission rates. tance 6700 meters via copper telephone cables ximum 2.3Mbps download, 2.3Mbps upload. Ther speeds than standard ADSL ximum 52Mbps download, 16 Mbps upload up to 1200 ers peed for two copper cables for 3650 meters mum guaranteed bandwidth provided by service provider. N Packet Transmission Single source send to single destination Single source send to multiple destinations	IDS/IPS Firewall a S DMZ (Demilitarized zone) Bastion Host - Dua Screened Subnet - Po Virus Worms Logic Bomb Trojan Backdoor	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter ecurity cure network between ternal internet facing and ernal networks. Ital-Homed - Three-Legged - Proxy Server - PBX - Honey ot - IDS/IPS No Malicious software, Self propagating vir b Time or condition lo Code and/or execut malicious Unauthorized code A series of small at scale attack	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D chan PRI B & D chan etwork Atta e, code and executa ruses ocked virus stables that act as I	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL ed 1024-49151 nnel 64 Kbps nnel 16 Kbps annels 64 Kbps acks tables Legitimate software, but are not legitimate and are	Packet-switched networks Packet-switched networks Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.11 IEEE 802.20 Standard 802.11a 802.11b 802.11g 802.11n 802.11n 802.11ac • 802.11 use CSMA/CA protocol accention of the second o	ze packets are sending between nodes and share th. ensitive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed Frequency (GHz) 54 Mbps 5 11 Mbps 2.4 54 Mbps 2.4 200+ Mbps 2.4 200+ Mbps 5 1Gbps 5 as DSSS or FHSS rectly connects peer-to-peer mode clients without a intral access point.
Types of D Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) High-bit-rate DSL (HDSL) Committed Information Rate (CIR) Unicast Multicast Broadcast Carrier-sense Multiple Access (CSMA) CSMA with Collision	• Fault tolerance • Fault tolerance • Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) whole speed higher than upload ximum 5500 meters distance via telephone lines. ximum download 8Mbps, upload 800Kbps. load speed adjust based on quality of the transmission line ximum 7Mbps download, 1Mbps upload over 5500 meters. The rate for upstream and downstream transmission rates. Thance 6700 meters via copper telephone cables ximum 2.3Mbps download, 2.3Mbps upload. The speeds than standard ADSL ximum 52Mbps download, 16 Mbps upload up to 1200 The speed for two copper cables for 3650 meters The provided by service provider. N Packet Transmission Single source send to single destination Single source send to all the destinations. One workstations retransmits frames until destination	IDS/IPS Firewall a Solution of Solution Host - Dua Screened Subnet - Post Screened Subnet - Post Substitution of Solution Host - Dua Screened Subnet - Post Substitution of Solution in the Solution Host - Dua Screened Subnet - Post Screened Subnet - Post Substitution in the Screened Subnet - Post Screened Subnet - Post Screened Subnet - Post Substitution in the Screened Substitution in the Screened Substitution in the Screened Subnet - Post Substitution in the Screened Substitution in the Screened Subnet - Post Substitution in the Screened Substitution in the Screened Subnet - Post Substitution in the Screened Substitution	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter ecurity cure network between ternal internet facing and ernal networks. Tal-Homed - Three-Legged - Proxy Server - PBX - Honey ot - IDS/IPS No Malicious software, Self propagating vir b Time or condition to Code and/or execut malicious Unauthorized code slicing A series of small at scale attack and Unauthorized monit Monitor and capture	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha PRI B & D cha etwork Atta e, code and executa ruses ocked virus stables that act as I	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL ed 1024-49151 nnel 64 Kbps nnel 16 Kbps annels 64 Kbps acks tables legitimate software, but are not legitimate and are ek intrusions that culminate in a cumulative large	Packet-switched networks Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.11 IEEE 802.20 Standard 802.11a 802.11b 802.11g 802.11n 802.11ac • 802.11 use CSMA/CA protocol a • 802.11 b uses only DSSS Wire Ad-hoc Mode Infrastructure Mode Infrastructure Mode WEP (Wired Equivalent Privacy) WPA (Wi-Fi Protected Use	ze packets are sending between nodes and share th. ensitive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed Frequency (GHz) 54 Mbps 5 11 Mbps 2.4 54 Mbps 2.4 200+ Mbps 2.4 200+ Mbps 5 as DSSS or FHSS eless Security Protocols rectly connects peer-to-peer mode clients without a ntral access point. ents connect centrally via access point.
Types of C Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) High-bit-rate DSL (HDSL) Committed Information Rate (CIR) Unicast Multicast Broadcast Carrier-sense Multiple Access (CSMA) CSMA with Collision Detection (CSMA/CD) Approximation Committed Commi	Fault tolerance Redundant Expensive to setup Pigital Subscriber Lines (DSL) winload speed higher than upload ximum 5500 meters distance via telephone lines. ximum download 8Mbps, upload 800Kbps. load speed adjust based on quality of the transmission line ximum 7Mbps download, 1Mbps upload over 5500 meters. The rate for upstream and downstream transmission rates. It tance 6700 meters via copper telephone cables ximum 2.3Mbps download, 2.3Mbps upload. It is speeds than standard ADSL ximum 52Mbps download, 16 Mbps upload up to 1200 Pers Piped for two copper cables for 3650 meters The provided by service provider. N Packet Transmission Single source send to single destination Single source send to all the destinations. One workstations retransmits frames until destination workstation receives. Terminates transmission on collision detection. Used by	IDS/IPS Firewall a S DMZ (Demilitarized zone) Bastion Host - Dua Screened Subnet - Po Virus Worms Logic Bomb Trojan Backdoor Salami, salami s Data diddlin Sniffing Session Hijack	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter ecurity cure network between ternal internet facing and ternal networks. Tal-Homed - Three-Legged - Proxy Server - PBX - Honey tot - IDS/IPS No Malicious software, Self propagating vir b Time or condition lo Code and/or execut malicious Unauthorized code Slicing A series of small at scale attack Ing Monitor and capture credentials	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha PRI B & D cha etwork Atta e, code and executa fruses ocked virus stables that act as I execution entry ttacks and network ata before process itoring of transmitter are of authentication	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL ed 1024-49151 nnel 64 Kbps nnel 16 Kbps annels 64 Kbps tables legitimate software, but are not legitimate and are ek intrusions that culminate in a cumulative large sing ted data	Packet-switched networks Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.11 IEEE 802.20 Standard 802.11a 802.11b 802.11g 802.11n 802.11a 802.11a \$802.11b \$802.11b \$802.11b \$802.11b \$802.11b \$802.11b \$802.11b \$802.11b \$802.11c • 802.11 use CSMA/CA protocol at 802.11b uses only DSSS Wire Ad-hoc Mode Infrastructure Mode VEP (Wired Equivalent Privacy) WPA (Wi-Fi Protected Access) WPA2 Use	ze packets are sending between nodes and share the ensitive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed Frequency (GHz) 54 Mbps 5 11 Mbps 2.4 54 Mbps 2.4 54 Mbps 2.4 59 Mps 5 10 Speed Security Protocols as DSSS or FHSS eless Security Protocols rectly connects peer-to-peer mode clients without a ntral access point. ents connect centrally via access point. ents Temporal Key Integrity Protocol (TKIP) for data
Types of D Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) High-bit-rate DSL (HDSL) Committed Information Rate (CIR) Unicast Multicast Broadcast Carrier-sense Multiple Access (CSMA) CSMA with Collision Detection (CSMA/CD) CSMA with Collision Avoidance (CSMA/CA)	• Fault tolerance • Fault tolerance • Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) whole speed higher than upload ximum 5500 meters distance via telephone lines. ximum download 8Mbps, upload 800Kbps. load speed adjust based on quality of the transmission line ximum 7Mbps download, 1Mbps upload over 5500 meters. The rate for upstream and downstream transmission rates. Itance 6700 meters via copper telephone cables ximum 2.3Mbps download, 2.3Mbps upload. Inter speeds than standard ADSL ximum 52Mbps download, 16 Mbps upload up to 1200 ers peed for two copper cables for 3650 meters mum guaranteed bandwidth provided by service provider. N Packet Transmission Single source send to multiple destination Single source send to all the destinations. One workstations retransmits frames until destination workstation receives. Terminates transmission on collision detection. Used by Ethernet. Upon detecting a busy transmission, pauses and then re-transmits delayed transmission at random interval to minimise two nodes re-sending at same time.	IDS/IPS Firewall a S DMZ (Demilitarized zone) Bastion Host - Dua Screened Subnet - Po Virus Worms Logic Bomb Trojan Backdoor Salami, salami s Data diddlin Sniffing Session Hijack DDoS (Distributed I Service)	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter Security cure network between sernal internet facing and ernal networks. al-Homed - Three-Legged - Proxy Server - PBX - Honey ot - IDS/IPS No Malicious software, Self propagating vir b Time or condition to Code and/or execut malicious Unauthorized code slicing A series of small at scale attack ng Alteration of raw da Unauthorized monit king Monitor and capture credentials Denial of Overloading a serve resulting in failure of	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha etwork Atta e, code and executa ruses locked virus stables that act as I execution entry ttacks and network ata before process itoring of transmitter re of authentication er with requests for	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL 2d 1024-49151 2d 1024-49151 2d 16 Kbps 2d 16 Kbps 2d 16 Kbps 2d 16 Kbps 2d 2d 16 Kbps 2d 2	Packet-switched networks Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.20 Standard 802.11a 802.11b 802.11g 802.11n 802.11ac • 802.11 use CSMA/CA protocol a • 802.11 b uses only DSSS Wire Ad-hoc Mode Infrastructure Mode VEP (Wired Equivalent Privacy) WPA (Wi-Fi Protected Access) WPA2 WPA2-Enterprise Mode Use TKIP (Temporal Key Integrity Use	ze packets are sending between nodes and share the ensitive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed Frequency (GHz) 54 Mbps 5 11 Mbps 2.4 54 Mbps 2.4 54 Mbps 5 11 Mbps 2.4 & 5 16bps 5 as DSSS or FHSS eless Security Protocols rectly connects peer-to-peer mode clients without a ntral access point. ents connect centrally via access point. ents connect centrally via access point. ents Temporal Key Integrity Protocol (TKIP) for data cryption. ess AES, key management.
Types of C Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) High-bit-rate DSL (HDSL) Committed Information Rate (CIR) Unicast Multicast Broadcast Carrier-sense Multiple Access (CSMA) CSMA with Collision Detection (CSMA/CA) Polling	• Fault tolerance • Fault tolerance • Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) whole a speed higher than upload ximum 5500 meters distance via telephone lines. ximum download 8Mbps, upload 800Kbps. load speed adjust based on quality of the transmission line ximum 7Mbps download, 1Mbps upload over 5500 meters. The rate for upstream and downstream transmission rates. It is taken to a speed than standard ADSL and the speeds for 3650 meters The provided by service provider. In the speeds than standard ADSL and the speeds of two copper cables for 3650 meters The provided by service provider. In the speeds to single destination Single source send to single destination Single source send to all the destinations. One workstations retransmits frames until destination workstation receives. Terminates transmission on collision detection. Used by Ethernet. Upon detecting a busy transmission, pauses and then re-transmits delayed transmission at random interval to minimise two nodes re-sending at same time. Sender sends only if polling system is free for the destination.	IDS/IPS Firewall a Signature of Signature o	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter Security Cure network between sernal internet facing and sernal networks. Inal-Homed - Three-Legged - Proxy Server - PBX - Honey out - IDS/IPS No Malicious software, Self propagating vir b Time or condition to Code and/or execut malicious Unauthorized code A series of small at scale attack and Alteration of raw da Unauthorized monit king Monitor and capture credentials Denial of Overloading a serve resulting in failure of Service	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha PRI B & D cha etwork Atta c, code and executa ruses ocked virus stables that act as I execution entry ttacks and network ata before process itoring of transmitter re of authentication er with requests for of service DDoS attack and TO	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL ed 1024-49151 enel 64 Kbps ennel 16 Kbps ennel 16 Kbps eacks eables Acks eables Legitimate software, but are not legitimate and are extended in a cumulative large esting eted data en sessions with the purpose of finding and hijacking er data packets well beyond its processing capacity extended of the communications. Extended protocol of the pro	Packet-switched networks Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.20 Standard 802.11a 802.11b 802.11g 802.11n 802.11ac • 802.11 use CSMA/CA protocol area (and the second points) • 802.11 b uses only DSSS Wire Ad-hoc Mode Infrastructure Mode Infrastructure Mode Virelation of the second points of the	ze packets are sending between nodes and share the consitive. val circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed Frequency (GHz) 54 Mbps 5 11 Mbps 2.4 54 Mbps 2.4 200+ Mbps 2.4 200+ Mbps 5 as DSSS or FHSS rectly connects peer-to-peer mode clients without a ntral access point. ents connect centrally via access point. rest Temporal Key Integrity Protocol (TKIP) for data cryption. res AES, key management. res RADIUS res RC4 stream cipher. silizes PPP and wireless authentication. Compatible with
Types of D Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) High-bit-rate DSL (HDSL) Committed Information Rate (CIR) Unicast Multicast Broadcast Carrier-sense Multiple Access (CSMA) CSMA with Collision Detection (CSMA/CD) CSMA with Collision Avoidance (CSMA/CA) Polling Token-passing	• Fault tolerance • Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) whole speed higher than upload ximum 5500 meters distance via telephone lines. ximum download 8Mbps, upload 800Kbps. load speed adjust based on quality of the transmission line ximum 7Mbps download, 1Mbps upload over 5500 meters. The rate for upstream and downstream transmission rates. The rate for upstream and downstream transmission rates. The rate of 700 meters via copper telephone cables ximum 2.3Mbps download, 2.3Mbps upload. The respects than standard ADSL ximum 52Mbps download, 16 Mbps upload up to 1200 ers. Peed for two copper cables for 3650 meters mum guaranteed bandwidth provided by service provider. N Packet Transmission Single source send to single destination Single source send to multiple destinations. One workstations retransmits frames until destination workstation receives. Terminates transmission on collision detection. Used by Ethernet. Upon detecting a busy transmission, pauses and then re-transmits delayed transmission at random interval to minimise two nodes re-sending at same time. Sender sends only if polling system is free for the destination. Sender can send only when token received indicating free to send.	IDS/IPS Firewall a Solution of Solution Host - Dua Screened Subnet - Position of Solution	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter ecurity cure network between remal internet facing and ernal networks. al-Homed - Three-Legged - Proxy Server - PBX - Honey ot - IDS/IPS No Malicious software, Self propagating vir b Time or condition to Code and/or execut malicious Unauthorized code slicing A series of small at scale attack ng Alteration of raw da Unauthorized monit king Coverloading a serve resulting in failure of Combination of a D service Particular kind of D Protocol (ICMP) page	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha PRI B & D cha etwork Atta e, code and executa ruses ocked virus stables that act as I execution entry ttacks and network ata before process itoring of transmitter of authentication er with requests for of service DDoS attack and TC DDoS attack using I ackets	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL and 1024-49151 annel 64 Kbps annels 65 Kbps annels 66 Kbps annels 66 Kbps annels 67 Kbps annels 68 Kbps annels 69 Kbps annels 69 Kbps annels 60 Kbps annels 60 Kbps annels 60 Kbps annels 60 Kbps annels 61 Kbps annels 62 Kbps annels 63 Kbps annels 64 Kbps annels 64 Kbps annels 65 Kbps annels 65 Kbps annels 66 Kbps annels 67 Kbps annels 67 Kbps annels 68 Kbps annels 69 Kbps annels 60 Kbps annels	Packet-switched networks Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.20 Standard 802.11a 802.11b 802.11g 802.11n 802.11a 802.11a 802.11b 802.11b 802.11b 802.11b 802.11b 802.11c *802.11b 802.11c *802.11b Cannot be conditionally be condi	ze packets are sending between nodes and share th. ensitive. ual circuits therefore less expensive. reless Networking
Types of D Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) High-bit-rate DSL (HDSL) Committed Information Rate (CIR) Unicast Multicast Broadcast Carrier-sense Multiple Access (CSMA) CSMA with Collision Detection (CSMA/CD) CSMA with Collision Avoidance (CSMA/CA) Polling Token-passing Broadcast Domain Collision Domain	• Fault tolerance • Fault tolerance • Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) whload speed higher than upload ximum 5500 meters distance via telephone lines. ximum download 8Mbps, upload 800Kbps. load speed adjust based on quality of the transmission line ximum 7Mbps download, 1Mbps upload over 5500 meters. The rate for upstream and downstream transmission rates. Itance 6700 meters via copper telephone cables ximum 2.3Mbps download, 2.3Mbps upload. The speeds than standard ADSL ximum 52Mbps download, 16 Mbps upload up to 1200 ters peed for two copper cables for 3650 meters The provided by service provider. N Packet Transmission Single source send to single destination Single source send to all the destinations. One workstations retransmits frames until destination workstation receives. Terminates transmission on collision detection. Used by Ethernet. Upon detecting a busy transmission, pauses and then re-transmits delayed transmission at random interval to minimise two nodes re-sending at same time. Sender sends only if polling system is free for the destination. Sender can send only when token received indicating free to send. Set of devices which receive broadcasts. Set of devices which can create collisions during	IDS/IPS Firewall a Signature of Signature o	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter Security cure network between sernal internet facing and ernal networks. Intrusion detection and prevention. Malicious and ernal networks. Intrusion detection and prevention. Intrusion detection and prevention. Merimeter Security Cure network between sernal internet facing and ernal networks. Intrusion detection and prevention. Malicious and Intrusion and capture of the propagation of the propagation of the propagation of the protocol (ICMP) paces of the pr	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha PRI B & D cha e, code and executa ruses ocked virus stables that act as I e execution entry ttacks and network ata before process itoring of transmitter of authentication er with requests for of service DDOS attack and TC DDOS attack and TC DDOS attack using I ackets stead of TCP	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL ed 1024-49151 enel 64 Kbps ennel 16 Kbps ennel 16 Kbps eacks eables Acks eables Legitimate software, but are not legitimate and are extended in a cumulative large esting eted data en sessions with the purpose of finding and hijacking er data packets well beyond its processing capacity extended of the communications. Extended protocol of the pro	Packet-switched networks Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.11 IEEE 802.20 Standard 802.11a 802.11b 802.11g 802.11n 802.11ac *802.11b 802.11b 802.11b 802.11b 802.11b Canada and and and and and and and and an	ze packets are sending between nodes and share th. ensitive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed Frequency (GHz) 54 Mbps 5 11 Mbps 2.4 24 200+ Mbps 2.4 200+ Mbps 5 as DSSS or FHSS eless Security Protocols rectly connects peer-to-peer mode clients without a ntral access point. ents connect centrally via access point. ents RADIUS es RC4 stream cipher. dilizes PPP and wireless authentication. Compatible with the enter encryption technologies. capsulates EAP within an encrypted and authenticated S tunnel. 2.1x, use with EAP in switching environment
Types of D Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) High-bit-rate DSL (HDSL) Committed Information Rate (CIR) Unicast Multicast Broadcast Carrier-sense Multiple Access (CSMA) CSMA with Collision Detection (CSMA/CD) CSMA with Collision Avoidance (CSMA/CA) Polling Token-passing Broadcast Domain Collision Domain Layer 2 Switch	• Fault tolerance • Fault tolerance • Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) whole a speed higher than upload ximum 5500 meters distance via telephone lines. ximum download 8Mbps, upload 800Kbps. load speed adjust based on quality of the transmission line ximum 7Mbps download, 1Mbps upload over 5500 meters. The rate for upstream and downstream transmission rates. The rate for upstream and downstream transmission please with the destination. Packet Transmission Single source send to single destination. Source packet send to all the destinations. One workstations retransmits frames until destination workstation receives. Terminates transmission on collision detection. Used by Ethernet. Upon detecting a busy transmission, pauses and then re-transmits delayed transmission at random interval to minimise two nodes re-sending at same time. Sender sends only if polling system is free for the destination. Sender can send only when token received indicating free to send. Set of devices which receive broadcasts. Set of devices which can create collisions during simultaneous transfer of data. Creates VLANs	IDS/IPS Firewall a S DMZ (Demilitarized zone) Bastion Host - Dua Screened Subnet - Po Virus Worms Logic Bomb Trojan Backdoor Salami, salami s Data diddlin Sniffing Session Hijack DDOS (Distributed I Service) SYN Flood Smurf Fraggle	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter security cure network between sernal internet facing and sernal networks. Ial-Homed - Three-Legged - Proxy Server - PBX - Honey of - IDS/IPS Note that the properties of the propagating viries of the propag	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha PRI B & D cha etwork Atta e, code and executa fruses ocked virus stables that act as I execution entry ttacks and network ata before process itoring of transmitter e of authentication er with requests for of service DDoS attack and TC DDOS attack using I ackets stead of TCP ICMP tunnelling process ack that exploits a	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL 2d 1024-49151 2d 1024-49151 2d 16 Kbps 2d 16 Kbps 2d 16 Kbps 2d 16 Kbps 2d 2d 16 Kbps 2d 2	Packet-switched networks Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.11 IEEE 802.20 Standard 802.11a 802.11b 802.11g 802.11n 802.11a 802.11b 802.11b 802.11b 802.11b 802.11b 802.11b Constitution Protocol and the privacy) WPA (Wi-Fi Protected Access) WPA2 WPA2-Enterprise Mode TKIP (Temporal Key Integrity Protocol) EAP (Extensible Authentication Protocol) PEAP (Protected Extensible Authentication Protocol) Port Based Authentication Wire	ze packets are sending between nodes and share the consistive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed Frequency (GHz) 54 Mbps 5 11 Mbps 2.4 24 42 200+ Mbps 2.4 200+ Mbps 5 as DSSS or FHSS eless Security Protocols rectly connects peer-to-peer mode clients without a normal access point. ents connect centrally via access point. ents connect centrally via access point. ess Temporal Key Integrity Protocol (TKIP) for data cryption. ess AES, key management. ess RADIUS ess RC4 stream cipher. dilizes PPP and wireless authentication. Compatible with the enercyption technologies. capsulates EAP within an encrypted and authenticated S tunnel.
Types of D Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) Committed Information Rate (CIR) Unicast Multicast Broadcast Carrier-sense Multiple Access (CSMA) CSMA with Collision Detection (CSMA/CD) CSMA with Collision Avoidance (CSMA/CA) Polling Token-passing Broadcast Domain Collision Domain Layer 2 Switch Layer 3 Switch	Fault tolerance Fault tolerance Fault tolerance Fault tolerance Fault tolerance Redundant Expensive to setup Pigital Subscriber Lines (DSL) Winload speed higher than upload ximum 5500 meters distance via telephone lines. Ximum download 8Mbps, upload 800Kbps. Soad speed adjust based on quality of the transmission line Ximum 7Mbps download, 1Mbps upload over 5500 meters. The rate for upstream and downstream transmission rates. The tate for upstream and downstream transmission rates. The rate for two copper cables for 3650 meters. Packet Transmission Single source send to single destination. Single source send to multiple destinations. Source packet send to all the destinations. One workstations retransmits frames until destination workstation receives. Terminates transmission on collision detection. Used by Ethernet. Upon detecting a busy transmission, pauses and then re-transmits delayed transmission at random interval to minimise two nodes re-sending at same time. Sender sends only if polling system is free for the destination. Sender can send only when token received indicating free to send. Set of devices which receive broadcasts. Set of devices which can create collisions during simultaneous transfer of data. Creates VLANs Interconnects VLANs	IDS/IPS Firewall a Sector of Sector	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter Security cure network between sernal internet facing and ernal networks. sal-Homed - Three-Legged - Proxy Server - PBX - Honey ot - IDS/IPS No Malicious software, Self propagating vir b Time or condition to Code and/or execut malicious Unauthorized code slicing A series of small at scale attack and Unauthorized monit king Monitor and capture credentials Denial of Overloading a serve resulting in failure of Service Particular kind of De Protocol (ICMP) par Smurf with UDP ins Uses the common I A type of DDoS atta sending fragmented	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha PRI B & D cha etwork Atta e, code and executar suses ocked virus stables that act as I execution entry ttacks and network ata before process itoring of transmitter e of authentication er with requests for of service DDOS attack and TC DDOS attack and TC DDOS attack using I ackets stead of TCP ICMP tunnelling presented that exploits a and packets to exhause	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL 2d 1024-49151 2d 1024-49151 2d 16 Kbps 2d 16 Kbps 2d 16 Kbps 2d 16 Kbps 2d 2d 16 Kbps 2d 2	Packet-switched networks Packet-switched networks Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.11 IEEE 802.20 Standard 802.11a 802.11b 802.11b 802.11g 802.11n 802.11ac 802.11ac 802.11b use cSMA/CA protocol at 802.11b uses only DSSS Wire Ad-hoc Mode Infrastructure Mode VEP (Wired Equivalent Privacy) WPA (Wi-Fi Protected Access) WPA2 WPA2-Enterprise Mode TKIP (Temporal Key Integrity Protocol) EAP (Extensible Authentication Protocol) PEAP (Protected Extensible Authentication Protocol) PEAP (Protected Extensible Authentication Protocol) Port Based Authentication Wire FHSS (Frequency Hopping Spectrum System) Use Use Can Vire FHSS (Frequency Hopping Spectrum System) Use Can Vire	ze packets are sending between nodes and share th. ensitive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed Frequency (GHz) 54 Mbps 5 11 Mbps 2.4 54 Mbps 2.4 200+ Mbps 2.4 55 Security Protocols rectly connects peer-to-peer mode clients without a ntral access point. ents connect centrally via access point. ents connect centrally via access point. ents connect centrally via access point. ents AES, key management. es RADIUS es RC4 stream cipher. ilizes PPP and wireless authentication. Compatible with her encryption technologies. capsulates EAP within an encrypted and authenticated S tunnel. 2.1x, use with EAP in switching environment reless Spread Spectrum
Types of D Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) High-bit-rate DSL (HDSL) Committed Information Rate (CIR) Unicast Multicast Broadcast Carrier-sense Multiple Access (CSMA) CSMA with Collision Detection (CSMA/CD) CSMA with Collision Avoidance (CSMA/CA) Polling Token-passing Broadcast Domain Collision Domain Layer 2 Switch Layer 3 Switch	• Fault tolerance • Fault tolerance • Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) whole a speed higher than upload ximum 5500 meters distance via telephone lines. ximum download 8Mbps, upload 800Kbps. load speed adjust based on quality of the transmission line ximum 7Mbps download, 1Mbps upload over 5500 meters. The rate for upstream and downstream transmission rates. The rate for upstream and downstream transmission please with the destination. Packet Transmission Single source send to single destination. Source packet send to all the destinations. One workstations retransmits frames until destination workstation receives. Terminates transmission on collision detection. Used by Ethernet. Upon detecting a busy transmission, pauses and then re-transmits delayed transmission at random interval to minimise two nodes re-sending at same time. Sender sends only if polling system is free for the destination. Sender can send only when token received indicating free to send. Set of devices which receive broadcasts. Set of devices which can create collisions during simultaneous transfer of data. Creates VLANs	IDS/IPS Firewall a Sector of Sector	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter security cure network between sernal internet facing and sernal networks. Inal-Homed - Three-Legged - Proxy Server - PBX - Honey of - IDS/IPS Note that the properties of small at scale and preventions of a domain of a Denial of Combination of a Deservice particular kind of Deprotocol (ICMP) particular kind of Deprotoc	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha PRI B & D cha execution entry ttacks and network ata before process itoring of transmitter ata before process i	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL ed 1024-49151 ennel 64 Kbps ennel 16 were entire	Packet-switched networks Packet-switched networks Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.11 IEEE 802.20 Standard 802.11a 802.11b 802.11g 802.11n 802.11a 802.11a 802.11b 802.11b 802.11b Standard * 802.11b * Soz.11b uses only DSSS Wire Ad-hoc Mode Infrastructure Mode VEP (Wired Equivalent Privacy) WPA (Wi-Fi Protected Access) WPA2 WPA2-Enterprise Mode TKIP (Temporal Key Integrity Protocol) EAP (Extensible Authentication Protocol) EAP (Protected Extensible Authentication Protocol) PEAP (Frequency Hopping Spectrum System) DSSS (Direct Sequence Par	ze packets are sending between nodes and share th. ensitive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed Frequency (GHz) 54 Mbps 5 11 Mbps 2.4 200+ Mbps 2.4 200+ Mbps 5 as DSSS or FHSS rectly connects peer-to-peer mode clients without a ntral access point. ents connect centrally via access point. ents connect centrally via access point. ents connect centrally via compatible with ner encryption. less RES, key management. less RADIUS less Spread Spectrum less all available frequencies, but only a single frequency in be used at a time.
Types of C Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) Committed Information Rate (CIR) Unicast Multicast Broadcast Carrier-sense Multiple Access (CSMA) CSMA with Collision Detection (CSMA/CD) CSMA with Collision Avoidance (CSMA/CA) Polling Token-passing Broadcast Domain Collision Domain Layer 2 Switch Layer 3 Switch Twisted Pair Pair of speed	Fault tolerance Redundant Expensive to setup Pigital Subscriber Lines (DSL) Whoload speed higher than upload Ximum 5500 meters distance via telephone lines. Ximum download 8Mbps, upload 800Kbps. Load speed adjust based on quality of the transmission line Ximum 7Mbps download, 1Mbps upload over 5500 meters. Me rate for upstream and downstream transmission rates. Annue 6700 meters via copper telephone cables Ximum 2.3Mbps download, 2.3Mbps upload. Alpher speeds than standard ADSL Ximum 52Mbps download, 16 Mbps upload up to 1200 Pers Packet Transmission Single source send to single destination Single source send to multiple destinations. One workstations retransmits frames until destination workstation receives. Terminates transmission on collision detection. Used by Ethernet. Upon detecting a busy transmission, pauses and then re-transmits delayed transmission at random interval to minimise two nodes re-sending at same time. Sender sends only if polling system is free for the destination. Sender can send only when token received indicating free to send. Set of devices which can create collisions during simultaneous transfer of data. Creates VLANs Interconnects VLANs LAN / WAN Media	IDS/IPS Firewall a Sector (Demilitarized zone) Bastion Host - Dua Screened Subnet - Post Screened Screened Subnet - Post Screened Screened Screened Screened Screened Screened Screened Screened Screened Sc	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter recurity cure network between sernal internet facing and sernal networks. Internet of the company of the proxy Server - PBX - Honey of the proxy S	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha PRI B & D cha execution entry ttacks and network ata before process itoring of transmitter ata before process itori	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL ed 1024-49151 enel 64 Kbps enel 16 Kbps enel 16 Kbps annels 64 Kbps elegitimate software, but are not legitimate and are exist intrusions that culminate in a cumulative large sing ted data en sessions with the purpose of finding and hijacking er data packets well beyond its processing capacity er 3-way handshake exploit that results in denial of elarge numbers of Internet Control Message errogram to establish a covert channel on the network en bug in TCP/IP fragmentation reassembly by east channels est he same source and destination IP essages or injecting code via bluetooth to	Packet-switched networks Packet-switched networks Wire Wire Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.11 IEEE 802.20 Standard 802.11a 802.11b 802.11g 802.11n 802.11ac 802.11b 802.11b 802.11b 802.11b Standard 602.11b 802.11c Corport Ad-hoc Mode Infrastructure Mode Infrastructure Mode WEP (Wired Equivalent Privacy) WPA (Wi-Fi Protected Access) WPA2 WPA2-Enterprise Mode TKIP (Temporal Key Integrity Protocol) EAP (Extensible Authentication Protocol) EAP (Extensible Authentication Protocol) PEAP (Protected Extensible Authentication Protocol) PORT Based Authentication Wire FHSS (Frequency Hopping Spectrum System) DSSS (Direct Sequence Spread Spectrum) OFDM (Orthogonal	ze packets are sending between nodes and share th. ensitive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed
Types of D Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) High-bit-rate DSL (HDSL) Committed Information Rate (CIR) Unicast Multicast Broadcast Carrier-sense Multiple Access (CSMA) CSMA with Collision Detection (CSMA/CD) CSMA with Collision Avoidance (CSMA/CA) Polling Token-passing Broadcast Domain Collision Domain Layer 2 Switch Layer 3 Switch Twisted Pair Pair of speed Unshielded Twisted Pair (UTP) Less in	• Fault tolerance • Fault tolerance • Fault tolerance • Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) whload speed higher than upload ximum 5500 meters distance via telephone lines. ximum download 8Mbps, upload 800Kbps. load speed adjust based on quality of the transmission line ximum 7Mbps download, 1Mbps upload over 5500 meters. The rate for upstream and downstream transmission rates. The rate for upstream and downstream transmission at pload. The rate of the value of the rate of the rat	IDS/IPS Firewall a Signature of Sinter of Sin	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter security cure network between sernal internet facing and sernal networks. Ial-Homed - Three-Legged - Proxy Server - PBX - Honey of - IDS/IPS Note that the propagating virity is a series of small at scale attack and unauthorized code and/or execut malicious Unauthorized code and a series of small at scale attack and unauthorized monitorials Denial of Overloading a serve resulting in failure of combination of a D service Particular kind of D Protocol (ICMP) part	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha PRI B & D cha etwork Atta e, code and executar iruses ocked virus atables that act as Interest and network ata before process itoring of transmitter of authentication er with requests for of service DDOS attack and TO DOS attack and TO DOS attack using Interest and packets stead of TCP ICMP tunnelling process and packets to exhause the process and packets to exhause the process and packets to exhause the packets of the	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL annel 64 Kbps nnel 16 Kbps annels 64 Kbps annels 64 Kbps annels of IV	Packet-switched networks Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.20 Standard 802.11a 802.11b 802.11b 802.11b 802.11a 802.11b 802.11b 802.11b 802.11b 802.11b 802.11b Source Infrastructure Mode Vire Ad-hoc Mode Infrastructure Mode WEP (Wired Equivalent Privacy) WPA (Wi-Fi Protected Access) WPA2 WPA2-Enterprise Mode TKIP (Temporal Key Integrity Protocol) EAP (Extensible Authentication Protocol) EAP (Extensible Authentication Protocol) PEAP (Protected Extensible Authentication Protocol) TLS Port Based Authentication DSSS (Direct Sequence Spread Spectrum) OFDM (Orthogonal Frequency-Division Multiplexing) Orthogonal Frequency-Division Multiplexing)	ze packets are sending between nodes and share th. ensitive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed Frequency (GHz) 54 Mbps 5 11 Mbps 2.4 54 Mbps 2.4 200+ Mbps 2.4 200+ Mbps 5 as DSSS or FHSS eless Security Protocols rectly connects peer-to-peer mode clients without a ntral access point. ents connect centrally via access point. ents connect centrally via access point. ess AES, key management. ess AES, key management. ess AES, key management. ess RADIUS ess RC4 stream cipher. dilizes PPP and wireless authentication. Compatible with ner encryption technologies. capsulates EAP within an encrypted and authenticated S tunnel. 2.1x, use with EAP in switching environment teless Spread Spectrum ess all available frequencies, but only a single frequency in be used at a time. roughput of rate compared to FHSS.
Types of E Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) High-bit-rate DSL (HDSL) Committed Information Rate (CIR) Unicast Multicast Broadcast Carrier-sense Multiple Access (CSMA) CSMA with Collision Detection (CSMA/CD) CSMA with Collision Avoidance (CSMA/CA) Polling Token-passing Broadcast Domain Collision Domain Layer 2 Switch Layer 3 Switch Twisted Pair Pair of speed Unshielded Twisted Pair (UTP) Shielded Twisted Pair (STP) Similar	Fault tolerance Fault toleranc	IDS/IPS Firewall a Secondary Secondary Session Hijack DDOS (Distributed I Service) Syn Flood Smurf Fraggle LOKI Teardrop Zero-day Land Attack Bluejacking, Blues DNS Spoofing, Poison hijack (Spoofing)	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter fecurity cure network between fernal internet facing and fernal networks. fal-Homed - Three-Legged - for Proxy Server - PBX - Honey fot - IDS/IPS Nalicious software, Self propagating vir by Time or condition to Code and/or execut malicious Unauthorized code A series of small at scale attack and Unauthorized monit king Monitor and capture credentials Denial of Overloading a serve resulting in failure of resulting in failure of greater in failure	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha PRI B & D cha e, code and executa ruses ocked virus stables that act as I e execution entry ttacks and network ata before process itoring of transmitter of authentication er with requests for of service DDOS attack using I ackets stead of TCP ICMP tunnelling process and packets to exhautory	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL ed 1024-49151 enel 64 Kbps enel 16 Kbps annels 64 Kbps enel 16 Kbps annels 64 Kbps enel 16	Packet-switched networks Packet-switched networks Wire Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.11 IEEE 802.20 Standard 802.11a 802.11b 802.11g 802.11n 802.11ac 802.11b 802.11b 802.11b 802.11b 802.11b Separation Wire Ad-hoc Mode Infrastructure Mode VEP (Wired Equivalent Privacy) WPA (Wi-Fi Protected Access) WPA2 WPA2-Enterprise Mode TKIP (Temporal Key Integrity Protocol) EAP (Extensible Authentication Protocol) EAP (Extensible Authentication Protocol) PEAP (Protected Extensible Authentication Protocol) PEAP (Protected Extensible Spread Spectrum) OFDM (Orthogonal Frequency-Division Multiplexing) FireWal Packet File Protocol and Protocol and Packet File Protocol and Pr	ze packets are sending between nodes and share the constitue. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed Frequency (GHz) 54 Mbps 5 11 Mbps 2.4 200+ Mbps 2.4 200+ Mbps 5 as DSSS or FHSS eless Security Protocols rectly connects peer-to-peer mode clients without a normal access point. entral access point. eless AES, key management. ese RADIUS ese RC4 stream cipher. dilizes PPP and wireless authentication. Compatible with her encryption technologies. capsulates EAP within an encrypted and authenticated S tunnel. 2.1x, use with EAP in switching environment eless Spread Spectrum ese all available frequencies, but only a single frequency no be used at a time. urallel use of all the available frequencies leads to higher roughput of rate compared to FHSS. thogonal Frequency-Division Multiplexing
Types of D Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) High-bit-rate DSL (HDSL) Committed Information Rate (CIR) Unicast Multicast Broadcast Carrier-sense Multiple Access (CSMA) CSMA with Collision Detection (CSMA/CD) CSMA with Collision Avoidance (CSMA/CA) Polling Token-passing Broadcast Domain Collision Domain Layer 2 Switch Layer 3 Switch Twisted Pair Pair of speed Unshielded Twisted Pair (UTP) Shielded Twisted Pair (STP) Coaxial Cable Thick of and 10	Fault tolerance Redundant Expensive to setup Poligital Subscriber Lines (DSL) Winload speed higher than upload ximum 5500 meters distance via telephone lines. Ximum download 8Mbps, upload 800Kbps. Food speed adjust based on quality of the transmission line ximum 7Mbps download, 1Mbps upload over 5500 meters. The rate for upstream and downstream transmission rates. The rate of the rate of the provided by service provider. Policy of the rate of the provided to the provider of the provider of the provider of the provider of the provider. Packet Transmission Single source send to single destination Single source send to single destination Source packet send to all the destinations One workstations retransmits frames until destination workstation receives. Terminates transmission on collision detection. Used by Ethernet. Upon detecting a busy transmission, pauses and then re-transmits delayed transmission at random interval to minimise two nodes re-sending at same time. Sender sends only if polling system is free for the destination. Sender can send only when token received indicating free to send. Set of devices which receive broadcasts. Set of devices which can create collisions during simultaneous transfer of data. Creates VLANs Interconnects VLANs LAN / WAN Media f twisted copper wires. Used in ETHERNET. Cat5/5e/6. Cat5 up to 100Mbps over 100 meters. Cat5e/6 speed 1000Mbps. mmune to Electromagnetic Interference (EMI) or to UTP but includes a protective shield. conduit instead of two copper wires. 10BASE-T, 100BASE-T, 100BASE-T.	Firewall a S DMZ (Demilitarized zone) Bastion Host - Dua Screened Subnet - Po Virus Worms Logic Bomb Trojan Backdoor Salami, salami s Data diddlin Sniffing Session Hijack DDOS (Distributed It Service) SYN Flood Smurf Fraggle LOKI Teardrop Zero-day Land Attack Bluejacking, Blues DNS Spoofing, Poisoning Session hijack	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter Gecurity Cure network between dernal internet facing and dernal networks. Intrusion detection and prevention. All Homed - Three-Legged - Proxy Server - PBX - Honey obt - IDS/IPS No Malicious software, Self propagating vir by Time or condition to Code and/or execut malicious Unauthorized code A series of small at scale attack and Unauthorized monit king Alteration of raw da Unauthorized monit king Combination of a D service Particular kind of D Protocol (ICMP) par Smurf with UDP ins Uses the common I A type of DDoS atta sending fragmented Exploitation of a do k Caused by sending Unauthorized devices Particular kind of D Protocol (ICMP) par Smurf with UDP ins Uses the common I A type of DDoS atta sending fragmented Exploitation of a do k Caused by sending Unauthorized devices Change TCP structure targeted systems. The introduction of corrupt IP results corrupt IP results Change TCP structure targeted systems. Tediction A successful attem	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha PRI B & D cha execution entry ttacks and network ata before process itoring of transmitter ata before process i	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL 2d 1024-49151 2d 1024-49151 2d 16 Kbps 2d 16 Kbps 2d 16 Kbps 2d 16 Kbps 2d 2	Packet-switched networks Packet-switched networks Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.11 IEEE 802.20 Standard 802.11a 802.11b 802.11b 802.11b 802.11c - 802.11 use CSMA/CA protocol at 802.11 us	ze packets are sending between nodes and share the ensitive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed Frequency (GHz) 54 Mbps 5 11 Mbps 2.4 54 Mbps 2.4 54 Mbps 5 16bps 5 as DSSS or FHSS eless Security Protocols rectly connects peer-to-peer mode clients without a nortal access point. entral access point. entral access point. entral access point. entral access point. ess Temporal Key Integrity Protocol (TKIP) for data cryption. ess AES, key management. ess AES, key management. ess RADIUS ess RC4 stream cipher. dilizes PPP and wireless authentication. Compatible with ner encryption technologies. capsulates EAP within an encrypted and authenticated S tunnel. 2.1x, use with EAP in switching environment releass Spread Spectrum ess all available frequencies, but only a single frequency in be used at a time. rallel use of all the available frequencies leads to higher roughput of rate compared to FHSS. thogonal Frequency-Division Multiplexing II Generation Evolution iiter Firewalls: Examines source/destination address, and ports of the incoming packets. And deny or permit to ACL. Network layer, stateless.
Types of D Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) High-bit-rate DSL (HDSL) Committed Information Rate (CIR) Unicast Multicast Broadcast Carrier-sense Multiple Access (CSMA) CSMA with Collision Detection (CSMA/CD) CSMA with Collision Avoidance (CSMA/CA) Polling Token-passing Broadcast Domain Collision Domain Layer 2 Switch Layer 3 Switch Twisted Pair Pair of speed Unshielded Twisted Pair (UTP) Shielded Twisted Pair (STP) Shielded Twisted Pair (STP) Coaxial Cable Thick of and 10 Uses lift of the committee of the committ	Fault tolerance Fault toleranc	IDS/IPS FireWall a Sector of Committee of Sector of Sec	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter security cure network between iternal internet facing and ernal networks. al-Homed - Three-Legged - Proxy Server - PBX - Honey of - IDS/IPS Malicious software, Self propagating virity of the propagating vir	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha PRI B & D cha execution entry ttacks and network ata before process itoring of transmitter ata before process i	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL ed 1024-49151 ennel 64 Kbps ennel 16 kbps	Packet-switched networks Packet-switched networks Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.11 IEEE 802.20 Standard 802.11a 802.11b 802.11b 802.11g 802.11n 802.11b 802.11b 802.11b 802.11b 802.11b Second Generation Firewalls Second Generation Firewall Pisse virtu First Generation Firewalls Second Generation Second Generation Firewall Pisse virtu First Generation Firewall Packet Filiprotocol according to the protocol accordi	ze packets are sending between nodes and share the consitive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed Frequency (GHz) 54 Mbps 5 11 Mbps 2.4 54 Mbps 5 16bps 5 as DSSS or FHSS rectly connects peer-to-peer mode clients without a nortal access point. ents connect centrally via access point. Infidentiality, uses RC4 for encryption. res AES, key management. res RADIUS res RC4 stream cipher. silizes PPP and wireless authentication. Compatible with ner encryption technologies. capsulates EAP within an encrypted and authenticated Stunnel. 2.1x, use with EAP in switching environment reless Spread Spectrum res all available frequencies, but only a single frequency in be used at a time. rallel use of all the available frequencies leads to higher roughput of rate compared to FHSS. Il Generation Evolution ill Generation Evolution
Types of C Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) High-bit-rate DSL (HDSL) Committed Information Rate (CIR) Unicast Multicast Broadcast Carrier-sense Multiple Access (CSMA) CSMA with Collision Detection (CSMA/CD) CSMA with Collision Avoidance (CSMA/CA) Polling Token-passing Broadcast Domain Collision Domain Layer 2 Switch Layer 3 Switch Twisted Pair Unshielded Twisted Pair (UTP) Shielded Twisted Pair (STP) Coaxial Cable Thick of and 10 Collision Co	• Fault tolerance • Fault tolerance • Fault tolerance • Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) winload speed higher than upload ximum 5500 meters distance via telephone lines. ximum download 8Mbps, upload 800Kbps. load speed adjust based on quality of the transmission line ximum 7Mbps download, 1Mbps upload over 5500 meters. me rate for upstream and downstream transmission rates. tance 6700 meters via copper telephone cables ximum 2.3Mbps download, 2.3Mbps upload. ther speeds than standard ADSL ximum 52Mbps download, 16 Mbps upload up to 1200 ers peed for two copper cables for 3650 meters mum guaranteed bandwidth provided by service provider. N Packet Transmission Single source send to single destination Single source send to multiple destinations Source packet send to all the destinations. One workstations retransmits frames until destination workstation receives. Terminates transmission on collision detection. Used by Ethernet. Upon detecting a busy transmission, pauses and then re-transmits delayed transmission at random interval to minimise two nodes re-sending at same time. Sender sends only if polling system is free for the destination. Sender can send only when token received indicating free to send. Set of devices which receive broadcasts. Set of devices which can create collisions during simultaneous transfer of data. Creates VLANs Interconnects VLANs LAN / WAN Media f twisted copper wires. Used in ETHERNET. Cat5/5e/6. Cat5 up to 100Mbps over 100 meters. Cat5e/6 speed 1000Mbps. mmune to Electromagnetic Interference (EMI) out to UTP but includes a protective shield. conduit instead of two copper wires. 10BASE-T, 100BASE-T, 100BASE-T. ight as the media to transmit signals. Gigabit speed at long tice. Less errors and signal loss. Immune to EMI. Multimode ngle mode. Single mode for outdoor long distance. upublic switched network. High Fault tolerance by relaying	IDS/IPS Firewall a Sector of Committee Sector	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter Security cure network between dernal internet facing and dernal networks. al-Homed - Three-Legged - Proxy Server - PBX - Honey out - IDS/IPS National A series of small at scale attack and Unauthorized code slicing A series of small at scale attack and Unauthorized monit with a scale attack and Unauthorized monit with under the scale attack and Unauthorized code and or execution attack and Unauthorized code and or execution and capture code attack and Unauthorized code and or execution and capture code attack and Unauthorized code and or execution and capture code attack and Unauthorized code and or execution and capture code attack and Unauthorized code and or execution and capture code attack and Unauthorized actack and Unauthorized code and or execution and capture code attack and Unauthorized actack and Unauthorized actack and Unauthorized actack and Unauthorized actack and Unauthorized code and or execution and capture code attack and Unauthorized code and or execution and capture code attack and Unauthorized code and I actack and I are code attack and I are code attack and I are c	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha PRI B & D cha execution entry ttacks and network ata before process itoring of transmitter of authentication er with requests for of service DDOS attack using I ackets stead of TCP ICMP tunnelling process and packets to exhautormant or previously ack that exploits a end packets to exhautormant or previously and packet that has also malicious messes for the packet to exhautormant or previously and packet that has also malicious messes for the packet to exhautormant or previously and packets to exhautormant or previously and packets to exhautormant or previously and packet that has also malicious messes for the packet to exhautormant or previously and packet that has also malicious messes for the packet to exhautormant or previously and packets to exhautormant or previously and pa	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL ed 1024-49151 ennel 64 Kbps ennel 16 kbps	Packet-switched networks Packet-switched networks Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.11 IEEE 802.20 Standard 802.11a 802.11b 802.11b 802.11c *802.11b 802.11b 802.11c *802.11b 802.11b 802.11b 802.11c *802.11b 802.11c *802.11c *802.11c *802.11c *Second Generation Firewalls Second Generation Firewalls Third Generation Fired Generation Firewalls *Stateful In *Stateful In	ze packets are sending between nodes and share the ensitive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed Frequency (GHz) 54 Mbps 5 11 Mbps 2.4 54 Mbps 2.4 54 Mbps 5 16bps 5 as DSSS or FHSS eless Security Protocols rectly connects peer-to-peer mode clients without a nitral access point. entral access point. ess RADIUS ess AES, key management. ess AES, key management. ess RC4 stream cipher. dilizes PPP and wireless authentication. Compatible with the encryption technologies. capsulates EAP within an encrypted and authenticated S tunnel. 2.1x, use with EAP in switching environment eless Spread Spectrum es all available frequencies, but only a single frequency no be used at a time. rallel use of all the available frequencies leads to higher oughput of rate compared to FHSS. thogonal Frequency-Division Multiplexing Il Generation Evolution cilter Firewalls: Examines source/destination address, and ports of the incoming packets. And deny or permit to ACL. Network layer, stateless. ion Level Firewall / Proxy Server: Masks the source
Types of C Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) Committed Information Rate (CIR) Unicast Multicast Broadcast Carrier-sense Multiple Access (CSMA) CSMA with Collision Detection (CSMA/CD) CSMA with Collision Avoidance (CSMA/CA) Polling Token-passing Broadcast Domain Collision Domain Layer 2 Switch Layer 3 Switch Twisted Pair (UTP) Shielded Twisted Pair (UTP) Shielded Twisted Pair (STP) Coaxial Cable Fiber Optic Frame Relay WAN Over a fault si	• Fault tolerance • Fault tolerance • Fault tolerance • Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) whole of speed higher than upload ximum 5500 meters distance via telephone lines. ximum download 8Mbps, upload 800Kbps. Joad speed adjust based on quality of the transmission line ximum 7Mbps download, 1Mbps upload over 5500 meters. The rate for upstream and downstream transmission rates. The rate of 700 meters via copper telephone cables ximum 2.3Mbps download, 2.3Mbps upload. The respeeds than standard ADSL ximum 52Mbps download, 16 Mbps upload up to 1200 The respeeds than standard ADSL ximum 52Mbps download, 16 Mbps upload up to 1200 The respect of two copper cables for 3650 meters The respect of two copper cables for 3650 meters The respect of the vice of the vice of the destination Single source send to single destinations Source packet send to all the destinations Source packet send to all the destinations Source packet send to all the destinations One workstations retransmits frames until destination workstation receives. Terminates transmission on collision detection. Used by Ethernet. Upon detecting a busy transmission, pauses and then re-transmits delayed transmission at random interval to minimise two nodes re-sending at same time. Sender sends only if polling system is free for the destination. Sender can send only when token received indicating free to send. Set of devices which receive broadcasts. Set of devices which can create collisions during simultaneous transfer of data. Creates VLANs Interconnects VLANs LAN / WAN Media If twisted copper wires. Used in ETHERNET. Cat5/5e/6. Cat5 up to 100Mbps over 100 meters. Cat5e/6 speed 1000Mbps. The to UTP but includes a protective shield. Conduit instead of two copper wires. 10BASE-T, 100BASE-T,	IDS/IPS Firewall a Security of SASL (Simple A Security of Securit	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter security cure network between sernal internet facing and sernal networks. Inal-Homed - Three-Legged - Proxy Server - PBX - Honey of - IDS/IPS Malicious software, Self propagating virit of the Code and/or execut malicious Unauthorized code and/or execut malicious Unauthorized code series of small at scale attack of the Code and provided in the	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha PRI B & D cha etwork Atta e, code and executa fruses ocked virus stables that act as I execution entry ttacks and network ata before process itoring of transmitter of authentication er with requests for of service DDOS attack using I eackets stead of TCP ICMP tunnelling presented to the previously and packets to exhaust formant or previously and packet that has being malicious messes within range of corrupt DNS data formated to predict a TCP in types of TCP core Email Secur endirectory based core and LDAP authenticate	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL dd 1024-49151 mnel 64 Kbps mnel 16 Kbps annels 64 Kbps acks tables Legitimate software, but are not legitimate and are sk intrusions that culminate in a cumulative large sing ted data on sessions with the purpose of finding and hijacking or data packets well beyond its processing capacity CP 3-way handshake exploit that results in denial of large numbers of Internet Control Message arogram to establish a covert channel on the network is bug in TCP/IP fragmentation reassembly by use channels sky unknown software bug the same source and destination IP ssages or injecting code via bluetooth to a into a DNS servers cache, causing it to serve to show the source as trusted to gain access to in pumber sequence resulting in an ability to immunications rity certificate management for email authentication.	Packet-switched networks Packet-switched networks Wire Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.11 IEEE 802.20 Standard 802.11a 802.11b 802.11g 802.11n 802.11ac • 802.11 use CSMA/CA protocol at 802.11 us	ze packets are sending between nodes and share the ensitive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed Frequency (GHz) 54 Mbps 5 11 Mbps 2.4 200+ Mbps 2.4 8.5 1Gbps 5 as DSSS or FHSS eless Security Protocols rectly connects peer-to-peer mode clients without a nortral access point. ents connect centrally via access point. ordidentiality, uses RC4 for encryption. ese AES, key management. ese RC4 stream cipher. dilizes PPP and wireless authentication. Compatible with the enercyption technologies. capsulates EAP within an encrypted and authenticated S tunnel. 2.1x, use with EAP in switching environment reless Spread Spectrum ese all available frequencies, but only a single frequency in be used at a time. rarillel use of all the available frequencies leads to higher roughput of rate compared to FHSS. thogonal Frequency-Division Multiplexing II Generation Evolution filter Firewalls: Examines source/destination address, and ports of the incompang packets. And deny or permit to ACL. Network layer, stateless. ion Level Firewall / Proxy Server: Masks the source sket transfer. Operating at Application layer, stateful. Inspection Firewall: Faster. State and context of the
Types of E Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) High-bit-rate DSL (HDSL) Committed Information Rate (CIR) Unicast Multicast Broadcast Carrier-sense Multiple Access (CSMA) CSMA with Collision Detection (CSMA/CD) CSMA with Collision Avoidance (CSMA/CA) Polling Token-passing Broadcast Domain Collision Domain Layer 2 Switch Layer 3 Switch Layer 3 Switch Unshielded Twisted Pair (UTP) Shielded Twisted Pair (UTP) Shielded Twisted Pair (STP) Coaxial Cable Thick (and 10 Uses lift of speed Unshielded Twisted Pair (STP) Coaxial Cable Thick (and 10 Uses lift of speed Uses lift of speed Network address Hide int Secure Network Secure N	Fault tolerance Fault toleranc	IDS/IPS Firewall a Security of SASL (Simple A Security Client SSL	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter recurity cure network between ternal internet facing and ternal networks. Ial-Homed - Three-Legged - Proxy Server - PBX - Honey of the IDS/IPS Malicious software, Self propagating virits of the Idea of Idea	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha PRI B & D cha e, code and executa fruses locked virus stables that act as I before process itoring of transmitter of authentication er with requests for of service DDOS attack and TC DDOS attack using I lackets stead of TCP ICMP tunnelling process and packets to exhaust ormant or previous and packet that has altered from the packet to exhaust ormant or previous and packet that has altered from the packet to exhaust ormant or previous and packet that has altered from the packet to exhaust ormant or previous and packet that has altered from the packet to exhaust ormant or previous and packet that has altered from the packet to exhaust ormant or previous and packet that has altered from the packet to exhaust ormant or previous and packet that has altered from the packet to exhaust ormant or previous and packet that has altered from the packet to exhaust ormant or previous and packet that has altered from the packet to exhaust ormant or previous and packet that has altered from the packet to exhaust ormant or previous and packet that has altered from the packet to exhaust ormant or previous and packet that has altered from the packet to exhaust ormant or previous and packet that has altered from the packet to exhaust ormant or previous and packet that has altered from the packet to exhaust ormant or previous and packet that has altered from the packet to exhaust ormant or previous and packet that has altered from the packet to exhaust ormant or previous and packet that has altered from the packet to exhaust ormant or previous and packet that has altered from the packet to exhaust ormant or previous and packet that has altered from the packet to exhaust ormant or previous and packet that has altered from the packet that has altere	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL and 1024-49151 nnel 64 Kbps nnel 16 Kbps annels 64 Kbps annels 64 Kbps annels 64 Kbps acks tables Legitimate software, but are not legitimate and are k intrusions that culminate in a cumulative large sing ted data an sessions with the purpose of finding and hijacking or data packets well beyond its processing capacity CP 3-way handshake exploit that results in denial of large numbers of Internet Control Message arogram to establish a covert channel on the network at bug in TCP/IP fragmentation reassembly by uset channels sly unknown software bug as the same source and destination IP sesages or injecting code via bluetooth to an into a DNS servers cache, causing it to serve to show the source as trusted to gain access to emmunications.	Packet-switched networks Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.11 IEEE 802.20 Standard 802.11a 802.11b 802.11g 802.11n 802.11a 802.11b 802.11b 802.11b 802.11b 802.11b 802.11b 802.11b 802.11b 802.11b 802.11c • 802.11 use CSMA/CA protocol a 802.11 b uses only DSSS Wire Ad-hoc Mode Infrastructure Mode Very (Wired Equivalent Privacy) WPA (Wi-Fi Protected Access) WPA2 WPA2-Enterprise Mode Use TKIP (Temporal Key Integrity Protocol) EAP (Extensible Authentication Protocol) FEAP (Protected Extensible Authentication Protocol) PEAP (Protected Extensible Authentication Protocol) TLS Port Based Authentication Spectrum System) DSSS (Direct Sequence Spread Spectrum) OFDM (Orthogonal Frequency-Division Multiplexing) Firewall First Generation Firewalls Packet Fill Incackets are Dynamic Incackets are	ze packets are sending between nodes and share the smistive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed Frequency (GHz) 54 Mbps 5 11 Mbps 2.4 54 Mbps 2.4 200+ Mbps 2.4 8.5 1Gbps 5 as DSSS or FHSS eless Security Protocols rectly connects peer-to-peer mode clients without a nortal access point. entral access point. ents connect centrally via access point. Infidentiality, uses RC4 for encryption. es Temporal Key Integrity Protocol (TKIP) for data cryption. es RADIUS es RC4 stream cipher. ilizes PPP and wireless authentication. Compatible with her encryption technologies. capsulates EAP within an encrypted and authenticated S tunnel. 2.1x, use with EAP in switching environment eless Spread Spectrum es all available frequencies, but only a single frequency no be used at a time. ralled use of all the available frequencies leads to higher roughput of rate compared to FHSS. thogonal Frequency-Division Multiplexing Il Generation Evolution iller Firewalls: Examines source/destination address, and ports of the incoming packets. And deny or permit to ACL. Network layer, stateless. ion Level Firewall: Faster. State and context of the reinspection Firewall: Faster. State and context of the reinspection Firewall: Faster. State and context of the reinspection Firewall: Dynamic ACL modification illering nouters: Located in DMZ or boundary networks. Packet filtering and abstion host. Packet filtering and application layer, stateful.
Types of E Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) High-bit-rate DSL (VDSL) Committed Information Rate (CIR) Unicast Multicast Broadcast Carrier-sense Multiple Access (CSMA) CSMA with Collision Detection (CSMA/CD) CSMA with Collision Avoidance (CSMA/CA) Polling Token-passing Broadcast Domain Collision Domain Layer 2 Switch Layer 3 Switch Twisted Pair Pair of speed Unshielded Twisted Pair (UTP) Shielded Twisted Pair (STP) Coaxial Cable Fiber Optic Fiber Optic Frame Relay WAN Secure New Maxwork address translation (NAT) Hide interest of the sum of the	• Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) winload speed higher than upload ximum 5500 meters distance via telephone lines. ximum download 8Mbps, upload 800Kbps. Ioad speed adjust based on quality of the transmission line ximum 7Mbps download, 1Mbps upload over 5500 meters. The rate for upstream and downstream transmission rates. The tale of 700 meters via copper telephone cables ximum 2.3Mbps download, 2.3Mbps upload. The speeds than standard ADSL ximum 52Mbps download, 16 Mbps upload up to 1200 Fig. Packet Transmission Single source send to single destination Single source send to single destinations Source packet send to all the destinations. One workstations retransmits frames until destination workstation receives. Terminates transmission on collision detection. Used by Ethernet. Upon detecting a busy transmission, pauses and then re-transmits delayed transmission at random interval to minimise two nodes re-sending at same time. Sender can send only if polling system is free for the destination. Sender can send only when token received indicating free to send. Set of devices which receive broadcasts. Set of devices which raceive broadcasts. Set of devices which can create collisions during simultaneous transfer of data. Creates VLANs Interconnects VLANs LAN / WAN Media If twisted copper wires. Used in ETHERNET. Cat5/5e/6. Cat5 tup to 100Mbps over 100 meters. Cat5e/6 speed 1000Mbps. mmune to Electromagnetic Interference (EMI) Into UTP but includes a protective shield. conduit instead of two copper wires. 10BASE-T, 100BASE-T, 100B	IDS/IPS Firewall a Securical Securical Substance Subnet - Dustance Subnet - Post Screened Subnet - Post Subnet Subnet - Post Subnet Subnet - Post Subnet Subnet - Post Subnet Su	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter recurity cure network between dernal internet facing and dernal networks. Ial-Homed - Three-Legged - Proxy Server - PBX - Honey of the IDS/IPS Malicious software, Self propagating virits of the Idea of Idea of the Idea of the Idea of Idea of the Idea of Idea	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha PRI B & D cha ruses ocked virus atables that act as I execution entry ttacks and network ata before process itoring of transmitter of authentication er with requests for of service DDOS attack and TO DDOS attack using I ackets stead of TCP ICMP tunnelling present that has act packets to exhau- commant or previously a packet that has act packet that has act process and record that has act packet to exhau- commant or previously a packet that has act packet that	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL annel 64 Kbps nnel 16 Kbps annels 64 Kbps acks tables Legitimate software, but are not legitimate and are sk intrusions that culminate in a cumulative large sing ted data an sessions with the purpose of finding and hijacking or data packets well beyond its processing capacity CP 3-way handshake exploit that results in denial of large numbers of Internet Control Message arogram to establish a covert channel on the network of bug in TCP/IP fragmentation reassembly by use channels sky unknown software bug sthe same source and destination IP ssages or injecting code via bluetooth to a into a DNS servers cache, causing it to serve to show the source as trusted to gain access to a prumber sequence resulting in an ability to immunications rity pertificate management for email authentication. authenticate against a server.	Packet-switched networks Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.11 IEEE 802.20 Standard 802.11a 802.11b 802.11b 802.11b 802.11c 802.11b 802.11c • 802.11 use CSMA/CA protocol at 802.11b uses only DSSS Wire Ad-hoc Mode Infrastructure Mode VEP (Wired Equivalent Privacy) WPA (Wi-Fi Protected Access) WPA2 WPA2-Enterprise Mode TKIP (Temporal Key Integrity Protocol) EAP (Extensible Authentication Protocol) TLS POTO Based Authentication PEAP (Protected Extensible Authentication Protocol) TLS Port Based Authentication PEAP (Protected Extensible Authentication Protocol) TCS Port Based Authentication PEAP (Protected Extensible Authentication Protocol) TCS Port Based Authentication PEAP (Protected Extensible Authentication Protocol) TCS Port Based Authentication Third Generation Firewalls First Generation Firewalls First Generation Firewalls Second Generation Firewalls Firewalls Firewall Second Generation Firewalls Packet Fil protocol an according to the protocol and acc	reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed Frequency (GHz) 54 Mbps 5 11 Mbps 2.4 54 Mbps 2.4 500 Hbps 5 13 GBps 5 16 GBps 5 16 GBps 5 18 GBps 5 18 GBps 15 18 G
Types of E Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) High-bit-rate DSL (HDSL) Committed Information Rate (CIR) Unicast Multicast Broadcast Carrier-sense Multiple Access (CSMA) CSMA with Collision Detection (CSMA/CD) CSMA with Collision Avoidance (CSMA/CA) Polling Token-passing Broadcast Domain Collision Domain Layer 2 Switch Layer 3 Switch Twisted Pair Unshielded Twisted Pair (UTP) Shielded Twisted Pair (STP) Coaxial Cable Thick of and 10 Uses li distance and sir Frame Relay WAN Secure Ne Network address translation (NAT) Port Address translation (PAT) Hide int Secure Ne Secure Ne Network address translation (PAT) Hide int Allow s application	• Fault tolerance • Fault tolerance • Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) whoload speed higher than upload ximum 5500 meters distance via telephone lines. ximum download 8Mbps, upload 800Kbps. load speed adjust based on quality of the transmission line ximum 7Mbps download, 1Mbps upload over 5500 meters. mer rate for upstream and downstream transmission rates. tance 6700 meters via copper telephone cables ximum 2.3Mbps download, 2.3Mbps upload. wher speeds than standard ADSL ximum 52Mbps download, 2.3Mbps upload up to 1200 ers peed for two copper cables for 3650 meters mum guaranteed bandwidth provided by service provider. N Packet Transmission Single source send to single destination Single source send to multiple destinations Source packet send to all the destinations. One workstations retransmits frames until destination workstation receives. Terminates transmission on collision detection. Used by Ethernet. Upon detecting a busy transmission, pauses and then retransmits delayed transmission at random interval to minimise two nodes re-sending at same time. Sender sends only if polling system is free for the destination. Sender sends only when token received indicating free to send. Set of devices which receive broadcasts. Set of devices which receive broadcasts. Set of devices which can create collisions during simultaneous transfer of data. Creates VLANs Interconnects VLANs LAN / WAN Media f twisted copper wires. Used in ETHERNET. Cat5/5e/6. Cat5 rup to 100Mbps over 100 meters. Cat5e/6 speed 1000Mbps. mmune to Electromagnetic Interference (EMI) or to UTP but includes a protective shield. conduit instead of two copper wires. 108ASE-T, 100BASE-T, 100DASE-T. light as the media to transmit signals. Gigabit speed at long ce. Less errors and signal loss. Immune to EMI. Multimode ngle mode. Single mode for outdoor long distance. upublic switched network. High Fault tolerance by relaying segments to working.	IDS/IPS FireWall a Sector of Committee of Sector of Salami, salami sec	domains. Routers separate broadcast domains Intrusion detection and prevention. Pand Perimeter recurity Cure network between dernal internet facing and dernal networks. Ial-Homed - Three-Legged - Proxy Server - PBX - Honey of - IDS/IPS Nalicious software, Self propagating virit of a Server of a Serve	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha PRI B & D cha e, code and executa ruses ocked virus stables that act as I e execution entry ttacks and network ata before process itoring of transmitter of authentication er with requests for of service DDOS attack using I ackets stead of TCP ICMP tunnelling pr ack that exploits a ed packets to exhau- commant or previous and packets to exhau- commant or previous for a packet that has ding malicious mes es within range f corrupt DNS data cure of the packet to the packet to est with requests of the packet to and packets to exhau- commant or previous for a packet that has ding malicious mes es within range f corrupt DNS data cure of the packet to est with the packet to a packet that has ding malicious mes est within range f corrupt DNS data cure of the packet to a packet that has ding malicious mes est within range f corrupt DNS data cure of the packet to a packet that has ding malicious mes est within range f corrupt DNS data cure of the packet to a packet that has ding malicious mes est within range f corrupt DNS data cure of the packet to a packet that has ding malicious mes est within range f corrupt DNS data cure of the packet to a packet that has ding malicious mes est within range f corrupt DNS data cure of the packet to a packet that has ding malicious mes est within range f corrupt DNS data cure of the packet to a packet that has ding malicious mes est within range f corrupt DNS data	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL ed 1024-49151 nnel 16 Kbps nnel 16 Kbps annels 64 Kbps acks tables Legitimate software, but are not legitimate and are sing ted data on sessions with the purpose of finding and hijacking or data packets well beyond its processing capacity CP 3-way handshake exploit that results in denial of large numbers of Internet Control Message rogram to establish a covert channel on the network as bug in TCP/IP fragmentation reassembly by uset channels sity unknown software bug the same source and destination IP sesages or injecting code via bluetooth to a into a DNS servers cache, causing it to serve to show the source as trusted to gain access to immunications rity certificate management for email authentication. authenticate against a server. crypted emails in single sign on (SSO)	Packet-switched networks Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.11 IEEE 802.20 Standard 802.11a 802.11b 802.11g 802.11b 802.11a 802.11b 802.11c Cor Portected Canceration Firewalls Firewalls Fourth Generation Firewalls Packet File Protocol and according to the Packet File Protocol and Canceration Firewalls Packet File Protocol According to the Packet File Packet File Protocol According to the Packet File Protocol According to the Packet File Packe	re packets are sending between nodes and share the shritive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed Frequency (GHz) 54 Mbps 5 11 Mbps 2.4 54 Mbps 2.4 54 Mbps 5 16bps 5 as DSSS or FHSS eless Security Protocols rectly connects peer-to-peer mode clients without a nitral access point. entral access point. entral access point. entral connect centrally via access point. entral access point. es Temporal Key Integrity Protocol (TKIP) for data cryption. es AES, key management. es RADIUS es RC4 stream cipher. dilizes PPP and wireless authentication. Compatible with ner encryption technologies. capsulates EAP within an encrypted and authenticated S tunnel. 2.1x, use with EAP in switching environment eless Spread Spectrum es all available frequencies, but only a single frequency in be used at a time. rallel use of all the available frequencies leads to higher oughput of rate compared to FHSS. thogonal Frequency-Division Multiplexing Il Generation Evolution iiter Firewall: Examines source/destination address, and ports of the incoming packets. And deny or permit to ACL. Network layer, stateless. Ion Level Firewall: Examines source/destination address, and ports of the incoming packets. And deny or permit to ACL. Network layer, stateless. Inspection Firewall: Examines source/destination address, and ports of the incoming packets. And deny or permit to ACL. Network layer, stateless. Inspection Firewall: Examines source/destination address, and ports of the incoming packets. And deny or permit to ACL. Network layer, stateless. Inspection Firewall: Examines source/destination address, and ports of the incoming packets. And deny or permit to ACL. Network layer, stateless. Inspection Firewall: Examines source/destination address, and ports of the incoming packets. And deny or permit to ACL. Network layer, stateless. Inspection Firewall: Used in networks facing both internal and alsubnet Firewall: Used in networks f
Types of E Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) High-bit-rate DSL (HDSL) Committed Information Rate (CIR) Unicast Multicast Broadcast Carrier-sense Multiple Access (CSMA) CSMA with Collision Detection (CSMA/CD) CSMA with Collision Avoidance (CSMA/CA) Polling Token-passing Broadcast Domain Collision Domain Layer 2 Switch Layer 3 Switch Twisted Pair Unshielded Twisted Pair (UTP) Shielded Twisted Pair (STP) Coaxial Cable Thick of speed Unshielded Twisted Pair (STP) Coaxial Cable Thick of speed Unshielded Twisted Pair (STP) Coaxial Cable Thick of speed Unshielded Twisted Pair (STP) Coaxial Cable Thick of speed Unshielded Twisted Pair (STP) Shielded Twisted Pair (STP) Coaxial Cable Thick of speed Unshielded Twisted Pair (STP) Coaxial Cable Thick of speed Unshielded Twisted Pair (STP) Coaxial Cable Thick of speed Unshielded Twisted Pair (STP) Shielded Twisted Pair (STP) Coaxial Cable Thick of speed Uses li distance and sin distance and sin Frame Relay WAN Thick of speed Uses li distance and sin Allow s Translation (NAT) Stateful NAT Static NAT Static NAT Static NAT One to of speed	• Fault tolerance • Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) wholad speed higher than upload ximum 5500 meters distance via telephone lines. ximum download 8Mbps, upload 800Kbps. load speed adjust based on quality of the transmission line ximum 7Mbps download, 1Mbps upload over 5500 meters. me rate for upstream and downstream transmission rates. tance 6700 meters via copper telephone cables ximum 2.3Mbps download, 2.3Mbps upload up to 1200 ers peed for two copper cables for 3650 meters mum guaranteed bandwidth provided by service provider. N Packet Transmission Single source send to single destination Single source send to single destinations Source packet send to all the destinations. One workstations retransmits frames until destination workstation receives. Terminates transmission on collision detection. Used by Ethernet. Upon detecting a busy transmission, pauses and then re-transmits delayed transmission at random interval to minimise two nodes re-sending at same time. Sender sends only if polling system is free for the destination. Set of devices which receive broadcasts. Set of devices which receive broadcasts. Set of devices which can create collisions during simultaneous transfer of data. Creates VLANs Interconnects VLANs LAN / WAN Media f twisted copper wires. Used in ETHERNET. Cat5/5e/6. Cat5 up to 100Mbps over 100 meters. Cat5e/6 speed 100Mbps. mmune to Electromagnetic Interference (EMI) or to UTP but includes a protective shield. conduit instead of two copper wires. 10BASE-T, 100BASE-T, 100BASE-T, 100BASE-T. 100BASE-T, 100BASE-T. 1	IDS/IPS Firewall a Sector of Committee Sector of Salami, salami sector	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter security cure network between ternal internet facing and ternal networks. Ial-Homed - Three-Legged - Proxy Server - PBX - Honey of - IDS/IPS Malicious software, Self propagating virits Time or condition to Code and/or execut malicious Unauthorized code A series of small at scale attack and Unauthorized monits with the component of the component o	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha PRI B & D cha etwork Atta e, code and executa fruses locked virus latables that act as I execution entry ttacks and network ata before process litoring of transmitter fre of authentication er with requests for of service DDOS attack using I exekets litoring of TCP ICMP tunnelling presented that exploits a led packets to exhau- formant or previously a packet that has ling malicious mes les within range fre corrupt DNS data from to predict a TCF in types of TCP corr Email Secur et directory based come and the packet to a packet that has ling malicious mes ling wallicious mes ling wall	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL ad 1024-49151 annel 64 Kbps annels 64 Kbps acks tables Legitimate software, but are not legitimate and are ik intrusions that culminate in a cumulative large sing ted data an sessions with the purpose of finding and hijacking or data packets well beyond its processing capacity CP 3-way handshake exploit that results in denial of large numbers of Internet Control Message arogram to establish a covert channel on the network by bug in TCP/IP fragmentation reassembly by use channels sly unknown software bug the same source and destination IP seages or injecting code via bluetooth to a into a DNS servers cache, causing it to serve to show the source as trusted to gain access to the number sequence resulting in an ability to immunications rity pertificate management for email authentication. authenticate against a server. crypted emails in single sign on (SSO) end and multipart/encrypted framework to apply	Packet-switched networks Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.11 IEEE 802.20 Standard 802.11a 802.11b 802.11g 802.11b 802.11a 802.11b 802.11c Cor Portected Canceration Firewalls Firewalls Fourth Generation Firewalls Packet File Protocol and according to the Packet File Protocol and Canceration Firewalls Packet File Protocol According to the Packet File Packet File Protocol According to the Packet File Protocol According to the Packet File Packe	reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi LTE Wi-Fi Speed Frequency (GHz) 54 Mbps 5 11 Mbps 2.4 200+ Mbps 5 13 Gbps 5 as DSSS or FHSS eless Security Protocols rectly connects peer-to-peer mode clients without a nortal access point. entral access point. es RAPIUS es RC4 stream cipher. elizes PP and wireless authentication. Compatible with ere rencryption technologies. 2.1x, use with EAP in switching environment eless Spread Spectrum es all available frequencies, but only a single frequency in decidency in decidency in decidency in decidency in decidency in the frequency in the recognition of the frequency in the service of the incompared to FHSS. thoogonal Frequency-Division Multiplexing III Generation Evolution iiIter Firewalls: Examines source/destination address, and ports of the incoming packets. And deny or permit to ACL. Network layer, stateful. Inspection Firewall: Faster. State and context of the re inspected. Packet Filtering Firewall: Dynamic ACL modification in the properties of the incoming packets. And deny or permit to ACL. Network layer, stateful. Inspection Firewall: Faster. State and context of the re inspected. Packet Filtering Firewall: Dynamic ACL modification in the properties of the incoming at Application layer, stateful. Inspection Firewall: Faster. State and context of the re inspected. Packet Filtering Firewall: Dynamic ACL modification in the properties of the incoming at Application layer, stateful. Inspection Firewall: Seed in networks facing both internal and desubnet Firewall: Used in networks facing both internal and desubnet Firewall: Used in networks facing both internal and desubnet Firewall: Creates a Demilitarized Zone (DMZ) -
Types of E Asymmetric Digital Subscriber Line (ADSL) Rate Adaptive DSL (RADSL) Symmetric Digital Subscriber Line (SDSL) Very-high-bit-rate DSL (VDSL) Committed Information Rate (CIR) Unicast Multicast Broadcast Carrier-sense Multiple Access (CSMA) CSMA with Collision Detection (CSMA/CD) CSMA with Collision Detection (CSMA/CA) Polling Token-passing Broadcast Domain Collision Domain Layer 2 Switch Layer 3 Switch Twisted Pair Unshielded Twisted Pair (UTP) Shielded Twisted Pair (STP) Coaxial Cable Fiber Optic Fiber Optic Secure New States In Allow Standard Simulation Frame Relay WAN Secure New State In Allow State In Allow State In NAT Static NAT S	• Fault tolerance • Fault tolerance • Redundant • Expensive to setup Digital Subscriber Lines (DSL) wholad speed higher than upload ximum 5500 meters distance via telephone lines. ximum download 8Mbps, upload 800Kbps. load speed adjust based on quality of the transmission line ximum 7Mbps download, 1Mbps upload over 5500 meters. me rate for upstream and downstream transmission rates. tance 6700 meters via copper telephone cables ximum 2.3Mbps download, 2.3Mbps upload up to 1200 ers peed for two copper cables for 3650 meters mum guaranteed bandwidth provided by service provider. N Packet Transmission Single source send to single destination Single source send to single destinations Source packet send to all the destinations. One workstations retransmits frames until destination workstation receives. Terminates transmission on collision detection. Used by Ethernet. Upon detecting a busy transmission, pauses and then re-transmits delayed transmission at random interval to minimise two nodes re-sending at same time. Sender sends only if polling system is free for the destination. Set of devices which receive broadcasts. Set of devices which receive broadcasts. Set of devices which can create collisions during simultaneous transfer of data. Creates VLANs Interconnects VLANs LAN / WAN Media f twisted copper wires. Used in ETHERNET. Cat5/5e/6. Cat5 up to 100Mbps over 100 meters. Cat5e/6 speed 100Mbps. mmune to Electromagnetic Interference (EMI) or to UTP but includes a protective shield. conduit instead of two copper wires. 10BASE-T, 100BASE-T, 100BASE-T, 100BASE-T. 100BASE-T, 100BASE-T. 1	Firewall a S DMZ (Demilitarized zone) Bastion Host - Dua Screened Subnet - Po Virus Worms Logic Bomb Trojan Backdoor Salami, salami s Data diddlin Sniffing Session Hijack DDoS (Distributed In Service) SYN Flood Smurf Fraggle LOKI Teardrop Zero-day Land Attack Bluejacking, Blues DNS Spoofing, Poisoning Session hijack (Spoofing) A TCP sequence proform of the security of the s	domains. Routers separate broadcast domains Intrusion detection and prevention. and Perimeter decurity cure network between dernal internet facing and dernal networks. al-Homed - Three-Legged - Proxy Server - PBX - Honey of - IDS/IPS Malicious software, Self propagating virity of the Time or condition to Code and/or execut malicious Unauthorized code and dernal at scale attack and Unauthorized monitorial decembers of the Combination of a December of the Service of the Combination of a December of the Service of the Combination of a December of the Service of the Combination of a December of the Service of the	High-level Data Link Control (HDLC) Domain name system (DNS) T1 T3 ATM ISDN Reserved BRI B-chan BRI D-chan PRI B & D cha PRI B & D cha etwork Atta a, code and executa fruses ocked virus stables that act as I execution entry ttacks and network ata before process itoring of transmitter of authentication er with requests for of service DDOS attack using I ackets stead of TCP ICMP tunnelling presented to execute the execution or apacket that has ding malicious messes within range of corrupt DNS data cure of the packet to execution entry tack that exploits a execution entry and packets to exhaustor and the packet	Use DTE/DCE communications. Extended protocol for SDLC. Map domain names /host names to IP Address and vice versa. Leased Lines 1.544Mbps via telephone line 45Mbps via telephone line 155Mbps 64 or 128 Kbps REPLACED BY xDSL 64 1024-49151 69 16 Kbps 69 17 Kbps 69 18 Kbps 69 19 Kbps 69 19 Kbps 69 19 Kbps 69 19 Kbps 69 10 Kbps 60 Kbps	Packet-switched networks Wireless person IEEE 802.15 IEEE 802.3 IEEE 802.11 IEEE 802.20 Standard 802.11a 802.11b 802.11g 802.11n 802.11a 802.11a 802.11b 802.11c - 802.11b 802.11b 802.11b 802.11c - 802.1c - 802	re packets are sending between nodes and share the shritive. ual circuits therefore less expensive. reless Networking nal area network (WPAN) standards Bluetooth Ethernet Wi-Fi Speed Frequency (GHz) 54 Mbps 5 11 Mbps 2.4 54 Mbps 2.4 54 Mbps 5 16bps 5 as DSSS or FHSS eless Security Protocols rectly connects peer-to-peer mode clients without a nitral access point. Infidentiality, uses RC4 for encryption. res Temporal Key Integrity Protocol (TKIP) for data cryption. res RADIUS res RC4 stream cipher. Illizes PPP and wireless authentication. Compatible with ner encryption technologies. capsulates EAP within an encrypted and authenticated S tunnel. 2.1x, use with EAP in switching environment release Spread Spectrum res all available frequencies, but only a single frequency in be used at a time. rallel use of all the available frequencies leads to higher oughput of rate compared to FHSS. thogonal Frequency-Division Multiplexing Ill Generation Evolution ritter Firewall: Examines source/destination address, and ports of the incoming packets. And deny or permit to ACL. Network layer, stateless. Inspection Firewall: Teaster. State and context of the re inspected. Packet Filtering Firewall: Dynamic ACL modification illering Firewall: Dynamic ACL modification illering Firewall: Used in networks facing both internal relations. The packet Filtering Firewall: Used in networks facing both internal relations.