Domain 4: Network and Communication Security Common TCP Protocols

	DSI Reference Moc tween layers, Standard hardwa	-				
	Tip, OSI Mnemonics ople Seem To Need Data Pro Do Not Throw Sausage Piz	•				
Layer	Data	Security				
Application	Data	C, I, AU, N				
Presentation Data C, AU, Encryptio						
Session	Data	Ν				
Transport	Segment	C, AU, I				
Network	Packets	C, AU, I				
Data link						
Physical	Bits	С				
C-Confidential	ity All-Authentication I-Integrity N	-Non ronudiation				

C=Confidentiality, AU=Authentication, I=Interview	egrity, N=Non repudiation
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Layer (No)		Functions		Protocols	Hardware / Formats	
Physical (1)	Electric Bits to v	al signal voltage			Cables, HUB, USB, DSL Repeaters, ATM	
Data Link Layer (2)	Check i Destina	tection and control ntegrity of packets tion address, Frames MAC to IP address	RARP - SN MLP - Fran	P - L2TP ARP - AP - CHAP - LCP - ne Relay - HDLC - - Ethernet - Token I	Layer 2 Switch - bridges	
Network layer	segmer	, Layer 3 switching, Itation, logical sing. ATM. Packets.		P - OSPF - RIP - IP - HCP - ICMP	Layer 3 Switch - Router	
Transport	Segmer oriented	nt - Connection	TCP - UDP Reliable er transfer - Segmentat and error c	Routers - VPN concentrato rs - Gateway		
Session Layer		mplex, half duplex, full . peer connections.		- NSF - SQL - nd RPC - PPTP -	Gateways	
Presentation layer	· ·	ssion/decompression cryption/decryption	TCP - UDP	messages	Gateways JPEG - TIFF - MID - HTML	
Application layer	Data		TFTP - SM	- FTP - TELNET - TP - HTTP CDP - IP - NNTP - SSL - 'PS.	Gateways	
		TCP/IP	Model			
Layers		Action	Example P		rotocols	
Network ac	cess	Data transfer done at	Token ring • Fram		e Relay • FDDI	
		Create small data chu	inks called			

	Network and cor		Lon Secura	LCY	Common	ICP Protocois						cs companiern
	OSI Refere	nce Mode	el		Port	Protocol		IP Addresses			Port Ranges	
7 layers, Allow	changes between layers, Sta	andard hardwar	re/software inter	roperability.	20,21 22	FTP SSH	Public IPv4	• Class A: 0.0.0.0 – 127.255.255.255			Authenticatio	
	Tip, OSI Mnemonics All People Seem To Need Data Processing Please Do Not Throw Sausage Pizza Away		22 23 25	TELNET SMTP	address space	 Class B: 128.0.0.0 - 191.255.255.255 Class C: 192.0.0.0 - 223.255.255.255 Class A: 10.0.0.0 - 10.255.255.255 	Point to Point Tunr	eling Protocol	·CHAP=une	text, unencrypted ncrypted, encrypted encrypted, encrypted		
Layer	- Dat	a	Secur	-	53 110	DNS POP3	Private IPv4 address space	• Class B [.] 172 16 0 0 – 172 31 255 255	Challenge-Hands	hake Authentic ol (CHAP)	cation Encrypt user	name/password and ate periodically. Use in PPP.
Applicati Presentat			C, I, AL C, AU, Enc		80 143	HTTP IMAP	Subnet Masks	• Class A: 255.0.0.0 • Class B: 255.255.0.0	Layer 2 Tunneli	、 ,		ec for encryption.
Sessior Transpo			N C, AU	J.	389	LDAP	IPv4	• Class C: 255.255.255.0 32 bit octets		on Header (AH	Provide auth	entication and integrity, no
Networ	rk Pack	ets	C, AU		443 636	HTTPS Secure LDAP	IPv6	128 bit hexadecimal		· · ·	confidentiali	
Data lin Physica			C C		445	ACTIVE DIRECTORY		Network Types	Encapsulating Se		Shared secu	rity attributes between two
	C=Confidentiality, AU=Authenticati				1433 3389	Microsoft SQL RDP	Local Area	Geographic Distance and are is limited to one		sociations (SA)	network enti	ties.
Layer (No)	Functions	Prot	tocols	Hardware / Formats	137-139	NETBIOS	Network (LAN)			oort Mode el Mode	Payload is pr IP payload a	nd IP header are protected.
FI	lectrical signal			Cables, HUB, USB, DSL	Attacks i	in OSI layers	Campus Area Network (CAN)	Multiple buildings connected over fiber or wireless	-	Exchange (IKE	-	e encryption keys in AH or ESP.
Physical (1)	its to voltage			Repeaters,	Layer	Attack	Metropolitan Area Network	Metropolitan network span within cities	Remote Authenticat (RA	ion Dial-In User ADIUS)		encrypted but user on with cleartext.
Fr	rames setup	PPP - PPTP - I		ATM	Application	Phishing - Worms - Trojans	(MAN)			MP v3 nic Ports	Encrypts the 49152 - 6553	
	rror detection and control heck integrity of packets	RARP - SNAP	- CHAP - LCP -	Layer 2	Presentation	Phishing - Worms - Trojans	Wide Area network (WAN)	Interconnect LANs over large geographic area such as between countries or regions.		_		
	estination address, Frames se in MAC to IP address	MLP - Frame F ISL - MAC - Et	-	Switch - bridges	Session	Session hijack	Intranet	A private internal network connects external authorized persons access to	D Telnet		te Access Serv	
cc	onversion. outing, Layer 3 switching,	Ring - FDDI		Lover 2	Transport	SYN flood - fraggle smurfing flooding -	Extranet	intranet	Remote login		No password protectio	authentication. No encryption. n.
	egmentation, logical	ICMP - BGP - (BOOTP - DHC	OSPF - RIP - IP - P - ICMP	Layer 3 Switch -	Network	ICMP spoofing - DOS	Internet	Public network	SSH (Secure Terminal Access		Secure telnet	ored in a server known as a
ac	ddressing. ATM. Packets.	TCP - UDP dat		Routers -	Data link	Collision - DOS /DDOS - Eavesdropping	Netwo Software	Orking Methods & Standards Decoupling the network control and the	Access-Control	System	TACACS server. User a	uthentication requests are
Iransport	egment - Connection	Reliable end to transfer -	-	Routers - VPN	Physical	Signal Jamming - Wiretapping	defined	forwarding functions.	(TACACS	+		n of TACACS. Use two factor
or	riented	Segmentation and error chec		concentrato rs - Gateway	-	are Devices	networking (SDN)	Features -Agility, Central management, Programmatic configuration, Vendor neutrality.	Remote Authentic		authentication. Client/server protocol (use to enable AAA services for
Session Da	ata, simplex, half duplex, full	TCP - UDP - N	SF - SQL -	Cata	HUB	Layer 1 device forward	Converged protocols for	Transfer voice, data, video, images, over single	User Service (F	RADIUS)	remote access servers	
	upl Eg. peer connections.	RADIUS - and PPP	אדט - 2212 -	Gateways		frames via all ports digital to analog	media transfer Fibre Channel	network.	Virtual private net	work (VPN)	between two networks	communication channel or between a user and a
Presentation	ata ompression/decompression	TCP - HDP me	essades	Gateways JPEG - TIFF -	Modem	conversion	over Ethernet (FCoE)	Running fiber over Ethernet network.				P address conversion. Secured s such as L2TP or IPSEC.
	nd encryption/decryption			MID - HTML	Routers Bridge	Interconnect networks Interconnect networks in	Multiprotocol	Transfer data based on the short path labels		VPN 4	encryption opt	ions
Application Da	ata	TCP - UDP - F TFTP - SMTP	- HTTP CDP -	Gateways		Ethernet Inbound/outbound data	Label Switching	instead of the network IP addresses. No need of route table lookups.			PPP for authentication	
layer		SMB - SNMP - HTTP/HTTPS		Cultivays	Gateways	entry points for networks Frame forward in local	(MPLS) Internet Small	Standard for connecting data storage sites such	Point-to-Point Tunne	ling Protocol	No support for EAPDial in	
	TCP/IP	Model			Switch	network.	Computer Interface (ISCI)	as storage area networks or storage arrays.	(PPTP)		Connection setup use Data link layer	es plaintext
Layers	Action		Example Pro		Load balancers	Share network traffic load by distributing	Multilayer	Encryption and different protocols at different	e		Single connection pe Same as PPTP except	
Network acces	ss Data transfer done a	t this layer To	oken ring • Frame • Ethernet •	-	Buidilogi 9	traffic between two devices	Protocols	levels. Disadvantages are hiding coveted channel and weak encryptions.	s Layer 2 Tunneling Pi	rotocol (L2TP)	Commonly uses IPse	ec to secure L2TP packets
Internet	Create small data chu datagrams to be tran		• RARP • ARP •			Hide internal public IP address from external	Voice over Internet	Allows voice signals to be transferred over the	Internet Protocol Se	curity (IPeaa)	Network layerMultiple connection p	
	network access	layer			Proxies	public internet /Connection caching and	Protocol (VoIP)	 public Internet connection. Packet switching technology with higher 		Carry (IF SEC)	 Encryption and auther Confidentiality and in 	
Transport Application	Flow control and i Convert data into r		TCP • U Inet • SSH • DNS	• HTTP • FTP		filtering.	Asynchronous transfer mode	handwidth Uses 53-byte fixed size cells. On	Сс	ommunic	ation Hardwar	e Devices
Application	format		• SNMP • [DHCP	VPNs and VPN	Use to create VPN or aggregate VPN	(ATM)	Popular among ISPs	Concentrator			It signal for transmission over
	TCP 3-way		ке		concentrators	connections provide using different internet	X25	PTP connection between Data terminal equipment (DTE) and data circuit-terminating equipment	Multiplexer Co	•	ole signals into one sign	
	SYN - SYN/					links Capture or monitor		(DCE) Use with ISDN interfaces. Faster and use multiple		etransmit signa mplifies signal	Il received from one por strenath.	rt to all ports.
Тороlос	LAN Top gy Pro	-	Con	S	Protocol analyzers	network traffic in real-time ad offline	Frame Relay	PVCs, provides CIR. Higher performance. Need to have DTE/DCE at each connection point. Perform			ransmission T	Vnes
			• No redunda	incy	Unified threat	New generation	Synchronous	error correction.	Circuit quit-la			communication paths required.
BUS	Simple to	setup	 Single point Difficult to t 		management	vulnerability scanning application	Data Link	IBM proprietary protocol use with permanent dedicated leased lines.	Circuit-switched networks	• Stable spe	ed. Delay sensitive. ed by ISPs for telephony	
RING			No middle po Single point of		VLANs	Create collision domains. Routers	Control (SDLC) High-level Data		Packet-switched	-		etween nodes and share
Mesh			• Redundant		v LAINS	separate broadcast domains	Link Control (HDLC)	protocol for SDLC.	networks	• Delay sens		ovponoivo
			• Expensive to	•	IDS/IPS	Intrusion detection and prevention.	Domain name system (DNS)	Map domain names /host names to IP Address and vice versa.			l circuits therefore less	
Tyj Asymmetric Dig	pes of Digital Sub		· · · ·)			-,	Leased Lines	Wireless Networking Wireless personal area network (WPAN) standards			U U
Subscriber Lin	ne • Maximum 5500 me	eters distance v	via telephone line	es.		nd Perimeter	T1 1.544Mbps via telephone line		IEEE 802.15 Bluetooth		,	
(ADSL) Rate Adaptive D		st based on qua	ality of the transr				T3 ATM	45Mbps via telephone line 155Mbps	IEEE 802.3 IEEE 802.11			hernet Wi-Fi
(RADSL) Symmetric Digi	• Maximum 7Mbps c jital • Same rate for upsti	-	•		(Demilitarized exter	re network between rnal internet facing and	ISDN	64 or 128 Kbps REPLACED BY xDSL	IEEE 802.1			LTE
Subscriber Lin (SDSL)	· · ·	ers via copper t	telephone cables		· · ·	nal networks. I-Homed - Three-Legged -	Reserved BRI B-chan		Chan de sel		Wi-Fi Speed	
Very-high-bit-rate	• Higher speeds than	n standard ADS	L	to 1200	Screened Subnet - F	Proxy Server - PBX - Honey	BRI D-chan	nnel 16 Kbps	Standard 802.11a		Speed 54 Mbps	Frequency (GHz)2.4
(VDSL)	Meters	uownioad, 16 M	vinha nbioaq nb	ιο τΖΟΟ	Pot	- IDS/IPS	PRI B & D cha	annels 64 Kbps	802.11b 802.11g		11 Mbps 54 Mbps	5 2.4
High-bit-rate D (HDSL)	OSL T1 speed for two co	pper cables for	3650 meters				etwork Atta		802.11n		200+ Mbps	2.4
Committed Information Rate	Minimum duarantee	d bandwidth pro	ovided by servic	e provider.	Virus Worms	Malicious software, Self propagating vir		ables	802.11ac • 802.11 use CSMA	CA protocol as	1Gbps SDSSS or FHSS	5
	LAN Packet	Fransmiss	sion		Logic Bomb Time or condition locked virus					• 802.11 use CSMA/CA protocol as DSSS or FHSS • 802.11b uses only DSSS		
Unicas					Trojan Code and/or executables that act as legitimate software, but are not legitimate and are malicious					Wireless Security Protocols Directly connects peer-to-peer mode clients without a		
Multicas Broadca	5	•			Backdoor	Unauthorized code	-	k intrusions that culminate in a cumulative large	Ad-hoc Mod	e centr	al access point. ts connect centrally via	
Carrier-sense	Multiple One workstation	ns retransmits	frames until des	tination	Salami, salami sli	scale attack			WEP (Wired Equi	valent	identiality, uses RC4 for	-
Access (CS CSMA with C	•		ollision detectior	1. Used by	Data diddling Sniffing	Alteration of raw da Unauthorized monit	•		Privacy) WPA (Wi-Fi Prot			Protocol (TKIP) for data
Detection (CSI	SMA/CD) Ethernet.		ission, pauses ar	-	Session Hijacki	ng Monitor and capture	e of authenticatio	n sessions with the purpose of finding and hijacking	``	encry	/ption. AES, key management	
CSMA with C Avoidance (CS	re-transmits del	ayed transmiss	sion at random ir		DDoS (Distributed Do	enial of Overloading a serve		or data packets well beyond its processing capacity	WPA2-Enterprise	Mode Uses	RADIUS	
Polling	Sender sends o		g at same time. stem is free for t	the	Service)			CP 3-way handshake exploit that results in denial of	TKIP (Temporal Key Protocol)	Integrity Uses	RC4 stream cipher.	
	destination.	d only when tol	ken received indi	icating free to		service Particular kind of DI	DoS attack using l	large numbers of Internet Control Message	EAP (Extensil Authentication Pr		es PPP and wireless au r encryption technologie	Ithentication. Compatible with es.
Token-pas Broadcast D	send.				Smurf Fraggle	Protocol (ICMP) pad Smurf with UDP inst	ckets		PEAP (Protected Ex	tensible Enca	psulates EAP within an	encrypted and authenticated
Collision Do	Set of devices v	vhich can creat	e collisions duri	ng	LOKI			rogram to establish a covert channel on the networ	Authentication Press k Port Based Authentication	,	tunnel. 1x, use with EAP in swit	ching environment
	simultaneous tr							bug in TCP/IP fragmentation reassembly by			ess Spread Spectr	
Layer 2 Sw	witch Creates VLANs				Teardrop		exploite d		FHSS (Frequency H	Lawning Ilaac		

Domain 4: Network and Communication Security				Common	TCP Protocols				(CISSP Chea	at Sheet Se	eries compari tech			
	OS	I Reference Mo	odel		Port 20,21	Protocol FTP		IF	P Addresses		Po	ort Ranges	;		
7 layers, Allo	ow changes betwee	en layers, Standard harc Tip, OSI Mnemonics		eroperability.	22	SSH	Public IPv4	• Class	is A: 0.0.0.0 – 127.255.255.255 is B: 128.0.0.0 – 191.255.255.255			• PAP=Cle	ation methods: ear text, unencrypted		
	All People	Seem To Need Data			23	TELNET SMTP	address space	• Class	s C: 192.0.0.0 – 223.255.255.255	Point to Point Tunn	eling Protocol (PF	• CHAP=ι	Inencrypted, encrypted		
Lay		Not Throw Sausage I Data	Pizza A way Secu	ritv	53	DNS	Private IPv4 address space	• Class	s A: 10.0.0.0 – 10.255.255.255 s B: 172.16.0.0 – 172.31.255.255	Challenge-Handsl	nake Authenticatio		sername/password and		
Applic		Data	C, I, A	U, N	110 80	POP3 HTTP		• Class	s C: 192.168.0.0 - 192.168.255.255 s A: 255.0.0.0	Protoco	ol (CHAP)	re-authen	ticate periodically. Use in PPP.		
	PresentationDataC, AU, EncryptionSessionDataN		143	IMAP	Subnet Masks		s B: 255.255.0.0 s C: 255.255.255.0	Layer 2 Tunnelin	g Protocol (L2TP)) Use with	IPsec for encryption.				
	Transport Segment C, AU, I		389 443	LDAP HTTPS	IPv4		coctets	Authenticatio	on Header (AH)	Provide a confident	uthentication and integrity, no iality.				
	NetworkPacketsC, AU, IData linkFramesC		U, I	636	Secure LDAP	IPv6		it hexadecimal	Encapsulating Sec	curity Payload (ES		d IP packets and preserve integrity.			
Phys	sical	Bits	C		445 1433	ACTIVE DIRECTORY Microsoft SQL			etwork Types	Security Ass	ociations (SA)		ecurity attributes between two		
		U=Authentication, I=Integrit		Hardware /	3389	RDP	Local Area Network (LAN) Geographic Distance and are is limited to one building. Usually connect using copper wire or			ort Mode	network e Payload i	s protected.			
Layer (No)	Functio	ons	Protocols	Formats	137-139	NETBIOS	Campus Area	fiber o	optics ole buildings connected over fiber or		el Mode		d and IP header are protected.		
Physical (1)	Electrical signal			Cables, HUB, USB, DSL		in OSI layers	Network (CAN)		•	Internet Key I Remote Authenticati	Exchange (IKE) on Dial-In User Se		e the encryption keys in AH or ESP. I is encrypted but user		
T Hysical (T)	Bits to voltage			Repeaters, ATM	Layer	Attack Phishing - Worms -	Metropolitan Area Network	Metro	politan network span within cities		DIUS) MP v3		ation with cleartext. the passwords.		
	Frames setup Error detection ar	PPP - PPT	P - L2TP ARP -		Application	Trojans	(MAN) Wide Area	Interco	connect LANs over large geographic area		nic Ports	49152 - 6	•		
Data Link	Check integrity of	f packets MI P - Fra	IAP - CHAP - LCP - me Relay - HDLC -	Layer 2 Switch -	Presentation	Phishing - Worms - Trojans	network (WAN)) such a	as between countries or regions.		Pomoto	Access Se			
Layer (2)	Destination addre use in MAC to IP	ess, Frames	- Ethernet - Token	bridges	Session	Session hijack SYN flood - fraggle	Intranet	•	rate internal network ects external authorized persons access to	Telnet			rd authentication. No encryption.		
	conversion. Routing, Layer 3 s	switching		Layer 3	Transport	smurfing flooding -	Extranet Internet	intrane Public	et c network	Remote login (rlogin) No	password protec	• •		
Network layer	segmentation, log addressing. ATM.	gical	ip - OSPF - RIP - IP - DHCP - ICMP	Switch - Router	Network	ICMP spoofing - DOS Collision - DOS /DDOS			Methods & Standards	SSH (Secure S Terminal Access (,	cure telnet er credentials are	e stored in a server known as a		
	addressing. Arm.	TCP - UDF	P datagrams.	Routers -	Data link	- Eavesdropping	Software	U	ling the network control and the	Access-Control (TACACS	•	CACS server. Use ndled by this serv	er authentication requests are		
Transport	Segment - Connec	ction Reliable e transfer -	nd to end data	VPN	Physical	Signal Jamming - Wiretapping	defined networking	forwardi	ing functions. s -Agility, Central management,	TACACS-	Mc	ore advanced vers	sion of TACACS. Use two factor		
	oriented	Segmenta and error	ntion - sequencing - checking	concentrato rs - Gateway		are Devices	(SDN)		nmatic configuration, Vendor neutrality.	Remote Authentica	aut	thentication. ent/server protoc	col use to enable AAA services for		
Session	Data, simplex, hal	If duplex full	P - NSF - SQL -	_	HUB	Layer 1 device forward	Converged protocols for		r voice, data, video, images, over single	User Service (R	ADIUS) ren	note access serv	ers.		
Layer	dupl Eg. peer con	RADIUS - 2	and RPC - PPTP -	Gateways	пов	frames via all ports digital to analog	media transfer	network.	ς. 	Virtual private netw	het		ed communication channel rks or between a user and a		
Presentation	Data			Gateways	Modem	conversion	Fibre Channel over Ethernet	Running	g fiber over Ethernet network.	virtual private netw	i í net		or IP address conversion. Secured ions such as L2TP or IPSEC.		
layer	and encryption/dec	compression TCP - UDF ecryption	messages	JPEG - TIFF - MID - HTML	Routers	Interconnect networks Interconnect networks in	(FCoE) Multiprotocol								
Application			P - FTP - TELNET - 1TP - HTTP CDP -		Bridge	Ethernet	Label Switching	instead o	r data based on the short path labels of the network IP addresses. No need of			Cryption O			
layer	Data	SMB - SNI	MP - NNTP - SSL -	Gateways	Gateways	Inbound/outbound data entry points for networks	(MPLS)		ble lookups.	.	• N	No support for EA			
		HTTP/HT	IPS.		Switch	Frame forward in local network.	Internet Small Computer		d for connecting data storage sites such age area networks or storage arrays.	Point-to-Point Tunne (PPTP)	•	Dial in Connection setup	uses plaintext		
Layers	<u>.</u>	TCP/IP Model	Example P	ratacals		Share network traffic	Interface (ISCI)		n independent. ion and different protocols at different			Data link layer Single connection	per session		
Network ac		nsfer done at this layer	Token ring • Fram	e Relay • FDDI	Load balancers	load by distributing traffic between two	Multilayer Protocols	levels. Di	Disadvantages are hiding coveted channels ak encryptions.	Layer 2 Tunneling Pro			cept more secure Psec to secure L2TP packets		
		mall data chunks called	• Ethernet	• X.25		devices Hide internal public IP	Voice over		voice signals to be transferred over the		• N	Network layer			
Interne	t datagran	ns to be transferred via work access layer		IGMP • ICMP	Proxies	address from external public internet	Internet Protocol (VoIP)	public In	nternet connection.	Internet Protocol Sec		Aultiple connection Encryption and au	-		
					TIONICS							م م به الم	• • •		
Transpo		control and integrity	TCP・U	JDP		/Connection caching and	Asynchronous		switching technology with higher			Confidentiality an			
Transpo	rt Flow	-	TCP • L Telnet • SSH • DN • SNMP •	S•HTTP•FTP		•	transfer mode	bandwid demand	dth. Uses 53-byte fixed size cells. On I bandwidth allocation. Use fiber optics.		ommunicat	ion Hardw	are Devices		
	on Flow Conve	control and integrity ert data into readable format	Telnet • SSH • DN • SNMP •	S•HTTP•FTP	VPNs and VPN	/Connection caching and filtering.	-	bandwid demand Popular	dth. Uses 53-byte fixed size cells. On	Concentrator	ommunicat	ion Hardw levices into one i			
	on Flow Conve	control and integrity ert data into readable	Telnet • SSH • DN • SNMP • hake	S•HTTP•FTP	VPNs and VPN concentrators	/Connection caching and filtering. Use to create VPN or aggregate VPN	transfer mode	bandwid demand Popular a PTP con (DTE) an	dth. Uses 53-byte fixed size cells. On I bandwidth allocation. Use fiber optics. among ISPs	Concentrator Div on Multiplexer Co	vides connected c e output via netwo mbines multiple s	ion Hardw levices into one i ork. signals into one s	are Devices nput signal for transmission over signal for transmission.		
	on Flow Conve	control and integrity ert data into readable format 3-way Hands	Telnet • SSH • DN • SNMP • hake CK	S•HTTP•FTP	concentrators	/Connection caching and filtering. Use to create VPN or aggregate VPN connections provide using different internet links Capture or monitor	transfer mode (ATM)	bandwidd demand Popular a (DTE) an (DCE) Use with	dth. Uses 53-byte fixed size cells. On I bandwidth allocation. Use fiber optics. among ISPs nnection between Data terminal equipment nd data circuit-terminating equipment h ISDN interfaces. Faster and use multiple	ConcentratorDiversion onMultiplexerCondHubsRe	vides connected c e output via netwo	ion Hardw levices into one i ork. signals into one s ceived from one	are Devices nput signal for transmission over signal for transmission.		
	on Flow Conve	control and integrity ert data into readable format P 3-way Hands YN - SYN/ACK - AC	Telnet • SSH • DN • SNMP • hake CK	S•HTTP•FTP DHCP		/Connection caching and filtering. Use to create VPN or aggregate VPN connections provide using different internet links	transfer mode (ATM)	bandwidd demand Popular a (DTE) an (DCE) Use with PVCs, pr have DTE	dth. Uses 53-byte fixed size cells. On I bandwidth allocation. Use fiber optics. among ISPs nnection between Data terminal equipment nd data circuit-terminating equipment h ISDN interfaces. Faster and use multiple rovides CIR. Higher performance. Need to E/DCE at each connection point. Perform	ConcentratorDiversion onMultiplexerCondHubsRe	vides connected c e output via netwo mbines multiple s transmit signal re nplifies signal stre	ion Hardw levices into one i ork. signals into one s ceived from one	are Devices nput signal for transmission over signal for transmission. port to all ports.		
Application	irt Flow of Conve on TCP S logy	control and integrity ert data into readable format P 3-way Hands YN - SYN/ACK - AC _AN Topologie Pros	Telnet • SSH • DN • SNMP • hake CK S • No redund	S • HTTP • FTP DHCP 1S ancy	concentrators Protocol analyzers Unified threat	/Connection caching and filtering. Use to create VPN or aggregate VPN connections provide using different internet links Capture or monitor network traffic in	transfer mode (ATM) X25	bandwidd demand Popular a PTP con (DTE) an (DCE) Use with PVCs, pr have DTR error cor	dth. Uses 53-byte fixed size cells. On I bandwidth allocation. Use fiber optics. among ISPs nnection between Data terminal equipment nd data circuit-terminating equipment h ISDN interfaces. Faster and use multiple rovides CIR. Higher performance. Need to E/DCE at each connection point. Perform rrection.	ConcentratorDiversion onMultiplexerCondHubsRe	vides connected of e output via netwo mbines multiple s transmit signal re pplifies signal stre WAN Tra • Dedicated per	ion Hardw levices into one i ork. signals into one s aceived from one ength. Insmission	are Devices nput signal for transmission over signal for transmission. port to all ports.		
Application Topo BL	irt Flow of Conve on TCP S JS	control and integrity ert data into readable format P 3-way Handsl YN - SYN/ACK - AC AN Topologie Pros Simple to setup	Telnet • SSH • DN • SNMP • hake CK S • No redunda • Single poin • Difficult to	S • HTTP • FTP DHCP ns ancy it of failure troubleshoot	concentrators Protocol analyzers	 /Connection caching and filtering. Use to create VPN or aggregate VPN connections provide using different internet links Capture or monitor network traffic in real-time ad offline New generation vulnerability scanning application 	transfer mode (ATM) X25 Frame Relay Synchronous Data Link	bandwidd demand Popular a PTP con (DTE) an (DCE) Use with PVCs, pr have DTF error cor	dth. Uses 53-byte fixed size cells. On I bandwidth allocation. Use fiber optics. among ISPs nnection between Data terminal equipment nd data circuit-terminating equipment h ISDN interfaces. Faster and use multiple rovides CIR. Higher performance. Need to E/DCE at each connection point. Perform	ConcentratorDiv onMultiplexerCoHubsReRepeaterAn	vides connected of e output via netwo mbines multiple s transmit signal re pplifies signal stre WAN Tra • Dedicated per • Stable speed.	ion Hardw levices into one i ork. signals into one s ceived from one ength.	are Devices nput signal for transmission over signal for transmission. port to all ports. Types or communication paths required.		
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CISSP Cheat Sheet Series comparitech

	Port F	Ranges
	Point to Point Tunneling Protocol (PPTP)	Authentication methods: • PAP=Clear text, unencrypted • CHAP=unencrypted, encrypted • MS-CHAP=encrypted, encrypted
j	Challenge-Handshake Authentication Protocol (CHAP)	Encrypt username/password and re-authenticate periodically. Use in PPP.
	Layer 2 Tunneling Protocol (L2TP)	Use with IPsec for encryption.
	Authentication Header (AH)	Provide authentication and integrity, no confidentiality.
	Encapsulating Security Payload (ESP)	Encrypted IP packets and preserve integrity.
one	Security Associations (SA)	Shared security attributes between two network entities.
re or	Transport Mode	Payload is protected.
	Tunnel Mode	IP payload and IP header are protected.
	Internet Key Exchange (IKE)	Exchange the encryption keys in AH or ESP.
	Remote Authentication Dial-In User Service (RADIUS)	Password is encrypted but user authentication with cleartext.
	SNMP v3	Encrypts the passwords.
area	Dynamic Ports	49152 - 65535

Remo	ote Access Services				
Telnet	Username /Password authentication. No encryption.				
Remote login (rlogin)	No password protection.				
SSH (Secure Shell)	Secure telnet				
Terminal Access Controller Access-Control System (TACACS)	User credentials are stored in a server known as a TACACS server. User authentication requests are handled by this server.				
TACACS+	More advanced version of TACACS. Use two factor authentication.				
Remote Authentication Dial-In User Service (RADIUS)	Client/server protocol use to enable AAA services for remote access servers.				
Virtual private network (VPN)	Secure and encrypted communication channel between two networks or between a user and a network. Use NAT for IP address conversion. Secured with strong encryptions such as L2TP or IPSEC.				
VPN encryption options					

le lookups.		 PPP for authentication No support for EAP
for connecting data storage sites such e area networks or storage arrays. independent.	Point-to-Point Tunneling Protocol (PPTP)	 Dial in Connection setup uses plaintext Data link layer
on and different protocols at different sadvantages are hiding coveted channels cencryptions.	Layer 2 Tunneling Protocol (L2TP)	 Single connection per session Same as PPTP except more secure Commonly uses IPsec to secure L2TP packets
pice signals to be transferred over the ernet connection.	Internet Protocol Security (IPsec)	 Network layer Multiple connection per session Ensuration and authoritization

	Creates VLANS	Layer 2 Switch	
	n Interconnects VLANs	Layer 3 Switch	
	LAN / WAN Media		
Blueja	Pair of twisted copper wires. Used in ETHERNET. Cat5/5e/6. Cat5 speed up to 100Mbps over 100 meters. Cat5e/6 speed 1000Mbps.	I wisted Pair	
DN	Less immune to Electromagnetic Interference (EMI)	Unshielded Twisted Pair (UTP)	
Se	Similar to UTP but includes a protective shield.	Shielded Twisted Pair (STP)	
A TCP /	Thick conduit instead of two copper wires. 10BASE-T, 100BASE-T, and 1000BASE-T.		
LDAF	Uses light as the media to transmit signals. Gigabit speed at long distance. Less errors and signal loss. Immune to EMI. Multimode and single mode. Single mode for outdoor long distance.	Fiber Optic	
SAS	Over a public switched network. High Fault tolerance by relaying fault segments to working.	Frame Relay WAN	
	re Network Design - Components	Secur	
	Hide internal public IP address from external internet	Network address translation (NAT)	
MOSS	Allow sharing of public IP address for internal devices and applications using a given single public IP address assigned by ISP		
P	Keeps track of packets transfer between source and destinations	· · ·	
DKIN	One to one private to public IP address assigned between two end devices	Static NAT	
	Pool of internal IP maps one or several public IP address	Dynamic NAT F	

leardrop sending frage		gmented packets to exhaust channels			
Zero-day	Exploitation	of a dormant or previously unknown software bug			
Land Attack	Caused by s	ending a packet that has the same source and destination IP			
dileiacking Billesnarfing		ly sending malicious messages or injecting code via bluetooth to devices within range			
DNS Spoofing, DNS Poisoning	The introduc corrupt IP re	ction of corrupt DNS data into a DNS servers cache, causing it to serve esults			
Session hijacking Change TCP (Spoofing) targeted sys		P structure of the packet to show the source as trusted to gain access to stems.			
		Il attempt to predict a TCP number sequence resulting in an ability to e certain types of TCP communications			
		Email Security			
LDAP (Lightweight Directory Access Protocol)		Active directory based certificate management for email authentication.			
SASL (Simple Authentication and Security Layer)		Secure LDAP authentication.			
Client SSL Certificates		Client side certificate to authenticate against a server.			
S/MIME Certificates		Used for signed and encrypted emails in single sign on (SSO)			
IOSS (MIME Object Security Services)		Uses the multipart/signed and multipart/encrypted framework to apply digital signatures.			
PEM (Privacy-Enhanced Mail)		A sequence of RfCs (Request for Comments) for securing message authenticity.			
DKIM (Domainkeys Identi	fied Mail)	Technique for checking authenticity of original message.			
OAuth		An open protocol to allow secure authorization using tokens instead of passwords.			

		Uses all available frequencies, but only a single frequency can be used at a time.	
DSSS (Direct Sequ Spread Spectrur		Parallel use of all the available frequencies leads to higher throughput of rate compared to FHSS.	
OFDM (Orthogonal Frequency-Division Multiplexing)		Orthogonal Frequency-Division Multiplexing	
	Firev	vall Generation Evolution	
First Generation Firewalls	protoc	et Filter Firewalls: Examines source/destination address, ol and ports of the incoming packets. And deny or permit ling to ACL. Network layer, stateless.	
Second Generation Firewalls	• Application Level Firewall / Proxy Server: Masks the source during packet transfer. Operating at Application layer, stateful.		
Third Generation Firewalls		ful Inspection Firewall: Faster. State and context of the as are inspected.	
Fourth Generation Firewalls	• Packe Include proxy • Dual- and ex • Scree	mic Packet Filtering Firewall: Dynamic ACL modification et Filtering Routers: Located in DMZ or boundary networks. es packet-filter router and a bastion host. Packet filtering and homed Host Firewall: Used in networks facing both internal ternal ened-subnet Firewall: Creates a Demilitarized Zone (DMZ) - rk between trusted and untrusted	
Fifth Generation Firewalls	• Kerne networ	el Proxy Firewall: Analyzes packets remotely using virtual rk	
Next-generation Firewalls (NGFW)	• Deep	packet inspection (DPI) with IPS: Integrated with IPS/IDS	