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Can apply over multiple domains, groups and OU's. Password Policy: Password recovery Password retention Bad login attempt Password reuse Complexity Care and Use of Equipament: How you maintain company equipament. Home automation Video doorbells (e.g Ring-Bot device) Internet-connected garage door openers It knows when you are home (and when you aren't) HVAC - Heating, Ventilating, and Air Conditioning Thermodynamics, fluid mechanics, and heat transfer Very complex system Must be integrated into the fire system Workstation manages equipment Makes cooling and heating decisions for workspaces and data centers Traditionally not built with security in mind Very hard to recover from a infrastructure DoS SCADA | ICS: SCADA - Supervisory Control and Data Acquisition Pretty much ICS with more funcionality ICS - Industrial Control Systems HVAC - Heating Ventilation, and Air Conditioning Distributed control systems Real-time information System control Requires extensive segmentation No access from the outside SoC - System on a Chip Multiple components running on a single chip Common with embedded systems Small form-factor External interface support Cache memory, flash memory Usually lower power consumption As shown above, you can see the Raspberry Pi 4 and the chip (Broadcom processor) controlling every interface on the device (HDMI ports, Ethernet, etc) Security considerations are important Difficult to upgrade hardware Limited off-the-shelf security options Printers, Scanners and Fax machines All-in-one or multifunction devices (MFD) Everything you need in one single device Printers have a very sophisticated firmware Some images are stored locally on the device Can be retrieved externally Logs are stored on the device Contain communication and fax details Camera systems Video monitoring for home or office Video recorders and Cameras are IP devices Authenticate using a specialized application Privacy concerns Another Devices (Special purpose) Medical devices Heart monitors, insulin pumps Often use older OS Vehicles Internal network is often accessible from mobile networks Control internal electronics Disable the engine Aircraft / UAV (Unmanned aerial vehicle) DoS could damage the aircraft and other on the ground Securing Static Hosts Change default passwords Turn off unnecessary services Monitoring security and firmware updates Defense in depth Network Segmentation - VLANs with Firewalls; VPN to connect a pipeline securely. SQL injection (queries) inner join select from insert into LDAP injection (queries info) Based on X.500 protocol DC = Domain Component OU = Organizational Unit CN = Common Name Buffer Overflow - overflows the input directly to the memory Integer Overflow - overflow an input variable (e.g typing a large number on calculate forcing an error) Applications Vulnerabilities Race Condition - A race condition is a flaw that produces an unexpected result when timing of actions impact other actions. w = write - edit a file, add or delete files for directories. It provides an authentication mechanism to devices wishing to attach to a LAN or WLAN. Model Verification match the application to the aspect of the model. Stream ciphers & Block modes Stream ciphers Encryption is done one bit or byte at a time Provides high speed, low hardware complexity Used with symmetric encryption Not used in asymmetric encryption The starting state should never be the same twice Key is often combined with an initialization vector (IV) Block modes Encrypt fixed-length groups Often 64-bit or 128-bit blocks Pad added to short blocks Each block is enrypted or decrypted independently Symmetric encryption Similar to stream ciphers Block cipher modes of operation Avoid patterns in the encryption Many different modes to choose from Block Cipher Modes ECB - Eletronic Code Block (deprecated because nowdays is a week method that always produces the same output results with same input) Each block is encrypted with the same key. ALE (Annualized loss expectancy) = SLE x ARO Evaluating risk Risk register Every project has a plan, but also has risk Identify and document the risk associated with each step Apply possible solutions to the identified risks Monitor the results Supply chain assessment Get a product or service from supplier to customer Evaluate coordination between groups Identify areas of improvement Asses the IT systems supporting the operation Document the business process changes Business Impact Analysis Designed to mitigate the effects of an incident, not to prevent an incident. This data is continually fed into. MAC filtering is a good idea on system controllers of HVAC Remote Monitoring - VPN access, 802.1X Fire Suppression Eletronics require unique responses to fire Water is generally a bad thing Detection Smoke detector, flame detector, heat detector Suppress with water Suppress with chemicals Types of Fires and Appropriate Fire Extinguishers Class Type Contains A Ordinary(Wood, Paper) Foam, Water B Liquids(Gases, oil) CO2, Foam, Powder C Electrical (Electronic equipment) CO2 D Combustible metals (sodium, magnesium) Powder FM200 is a special extinguisher liquid that is great because it can stops fires, but can still save the electrical equipment; "Gold Standard" for fire suppression on server rooms. ▯ Attacks could be in the form of malformed network traffic or excessive amounts of traffic. Who trying talking to you? Secure Peripherals ⌨▯▯ Wireless keyboards and mice Wireless keyboards and mice communicate in the clear Use proprietary wireless communication protocols Over 2.4 GHz frequencies Easy to capture keystrokes with a receiver Inject keystrokes and mouse movements Control the computer remotely Some keyboard manufacturers support AES encryption Printers/multi-function devices Printer, scanner, fax Network connectivity Reconnaissance - log files for all activity, address books Unauthorized access - print without authentication Gather information - capture spool files Displays Eletromagnetic radiation Firmware hacks MicroSD cards Transfering over the 802.11 Wi-Fi (without removing the SD card from the device) SD card authentication vulnerabilities; Predictable access, easy to read files over Wi-Fi API access to the SD card External storage devices Digital cameras Operates as external storage when plugged into a workstation; Easy to move data around Camera firmware can be compromised Common security practices: Patch! Disable unecessary ports Avoid backdoors RFID (Radio Frequency Identification) Access badges Inventory/assembly line tracking Pet/animal identification Anything that needs to be tracked. 8. Aisles of equipment racks are set up such that there are alternating hot and cold aisles. Threat: Exploit vulnerabilities to harm assets. For ATMs, Web Servers, or other applications that perform an unusually high amount of key handling, it's usually a good idea to offload this work to other hardware. SIEM Logs Example Most Popular SIEM Tools: Splunk ArcSight ELK - Elastic Search, Log Stash and Kibana (Open Source) 3. It allows the user to display TCP/IP and other packets being transmitted or received over a network to which the computer is attached. Improper Error Handling - Errors are supposed to show least information about the system, to avoid additional information like Network Information, Memory Dump, Stack Traces, database dumps, etc. If your system has a UEFI BIOS, it also has the Secure Boot functionality. Organized Crime Professional Criminals Motivated by Money Very sophisticated Crime that's organized One person Hacks One person Manages the exploits One person Sells the data Another Handles customer support Lots of capital to fund hacking efforts operational Nation States / APT Governments - National Security, Job Security; Always an external entity Highest sophistication Military control, utilities, financial control Constant attacks, massive resources Advanced Persistent Threat Insiders Has institutional knowledge Attacks can be directed at vulnerable systems allowing the bad guy what, when and how to hit Can be sophisticated Extensive resources Competitors Many different motivaions - Espionage, harm reputation High level of sophistication Many different intents Shut down your competitor during an event Steal customer lists Corrupt manufacturing databases Take financial information Risk Assessment NIST SP 800-30 CVE (Common Vulnerabilities and Exposures) Nessus scanner Penetration Testing Environmental: Natural disasters outside the control of humans Manmade: Any threat that is not environmental Internal: Threat generated by internal sources, usually an insider to the organization External: Threat generated from outside your infrastructure After identified and analyzed risk, you must decide how to responde to the risks produced as a result of the analysis. Types of bluetooth: Class1 is 328' foot (100 meters) Class2 is 33' foot (10 meters) Class3 is 3' foot (1 meter) Most Mobile phones and Bluetooth headsets are Class2 (10 meters). To deal with this, update to the latest signatures and patch it. How RADIUS and TACACS+ works: [Authentication] -> The server authenticates username and password [Authorization] -> Determine if a user is allowed to connect to the client [Accounting] -> Log the connection RADIUS - Remote Authentication Dial-In User Service Used for network access Radius Server: Get the stack of usernames and passwords (can be MySQL, AD/DS, etc.) Radius Client: The Gateway between users and servers Radius Supplicant: The person that want to authenticate RADIUS can use up to 4 different ports: Ports used by RADIUS | :-:|- 1812 | 1813 | 1645 | 1646 | TACACS+ - Terminal Access Controller Access-Control System Plus Is really good to manage a big number of network devices. Network Firewalls - Concepts Control the flow of network traffic Standard issue - home, office, and in your operating system Corporate control of outbound and inbound area (sensitive data) Control of inappropriate content Protection adware, spyware etc Firewall Rules ACL - Access Control Lists Allow or disallow traffic based on tuples Grouping of categories (Source IP, Destination IP, port number, time of day, application, etc) Can be very general or very specific Implicit deny - prevents access unless specifically permitted. Procedures - Step by step process of how to do something. Hashing Algorithms MD5 - Message Digest Algorithm First published in April 1992 Replaced MD4 128-bit hash value 1996: Vulnerabilities found SHA - Secure Hash Algorithm SHA-1 Widely used 160-bit digest 2005: Collision attacks published SHA-2 Family SHA-256 | minor version: SHA-224 SHA-512 | minor version: SHA-384 SHA-3 Uses a hash function called Keccack and has the same length of SHA-2. Good method to protect not only Data, but system resources Clustering is Expensive Load Balancing Refers to efficiently distributing incoming network traffic across a group of backend servers, also known as a server farm or server pool. Penetration test will actually try to grab the data itself. Blowfish Block 64-bit 16 32-448 bits Public domain algorithm. Infrastructure as Code (IaC) - means to use preset definition files as opposed to manual configurations to set up servers. Stateful Firewall Are better at identifying unauthorized and forged communications. Default Passwords - Simply avoid default passwords and use good password methodologies. Sideloading Installation of third-party applications that is different from original Application Store (Google Play, Apple Store) Carrier Unlocking Security revolves around connectivity - Moving to another carrier can circumvent the MDM Rooting/Jailbreaking Root Access Root Access Issues Auto updates disabled Trouble accessing the store Exposure to malware Things to AVOID on Mobile To achieve this topics you will need a good policy. Intrusive: You'll try out the vulnerability to see if it works. File Transfer Protocols Port Description 20 FTP Data / FTPS 21 FTP Control / FTPS 22 SSH - Secure Shell Remote Login Protocol / SCP - Secure Copy / SFTP(Secure FTP) 25 SMTP - Simple Mail Transfer Protocol (sends email) 53 DNS 67, 68 DHCP uses UDP 69 TFTP - Trivial File Transfer Protocol runs on UDP 110 POP (receives email) 137, 138, 139 NETBios Protocol 143 IMAP (receives email) 161, 162 SNMP - Simple Network Management Protocol 389 LDAP - Light Weight Directory Access Protocol 445 SMB 465, 587 SMTP over SSL/TLS encrypted 993 IMAP over TLS/TLS 995 POP over TLS/SSL 3389 RDP - Remote Desktop protocol (TCP) LDAP - Lightweight Directory Access Protocol Protocol for reading and writing directories over an IP network LDAP is lightweight and uses TCP/IP LDAP is the protocol used to query and update an X.500 directory Used in Windows Active Directory, Apple OpenDirectory, OpenLDAP, etc. Improper certificate and keymanagement Manage your keys and certificates What will be the organizations certificate authority? Spim - Phishing through instant messaging Vishing - Unsolicited use of voice to get sensitive information Click Jacking - malicious click bait sites that forces you type your PII or download some malicious software. Nmap - Nmap is a free and open-source network scanner. They watch network traffic and restrict / block packets based on source and destination address or static values (ACL Rules) as shown below. Network Zones - Concepts DMZ - Demilitarized Zone: Perimeter network; isolating untrusted network from LAN area. RAID 1+0 (10) Disk mirroring with striping - combines both RAID level 0 and 1 for performance and redundancy; a strip of two mirrored arrays. Privacy Policy: Are often for customers; defines how your data or usage will be shared with other resoruces. (192.168.1.128) at e8:33:b0:70:2c:71 [ether] on enp0s10 ? Every WAP have MAC address. Risk Management Risk management is the identification, evaluation, and prioritization of risks followed by coordinated and economical application of resources to minimize, monitor, and control the probability or impact of unfortunate events or to maximize the realization of opportunities. Proprietary Information: Information owned by a company that gives a certain competitive advantages. How much data loss is acceptable? The CIA Triad Confidentiality Keeping systems and data from being accessed, seen, read to anyone who is not authorized to do so. Vendor Diversity: Uses several vendors to supply equipament and services. Intrusive vs. To limit this risk, organizations take steps to monitor and manage mobile devices. Stateless Firewall Typically faster and perform better under havier traffic loads. The IP Security (IPsec) protocol provides a framework for configuring secure VPNs and is commonly deployed over the Internet to connect branch offices, remote employees, and business partners. Forward Proxy - Client The proxy simply forward the requests of respective client and retrieve the response back to the client. VPN Setup Steps Protocol to set up tunnel Protocol to handle authentication and encryption VPN Concentrators VPN appliances are usually located on the edge of the network Sites connect from one site to another across the Internet The Appliances can be a standalone VPN devices or it may be integrated into another technology, such as Firewall. Centralized features: Uses a Central repository Use SNMP Systems Pulls informaton needed and generates graphs and charts Monitoring-as-a-Services (MaaS) SIEM - Security Information and Event Management Collects data points from network, including log files, traffic captures, SNMP messages, and so on, from every host on the network. Printers and multifunction devices (MFDs) are very commonly connected with 802.11. Realistically, you will not always lose 100% (1) of the asset; you may lose only 20% (0.2) or 50% (0.5) for example. In particular, signals of 5 GHz frequencies do not penetrate solid objects as well as 2.4 GHz signals, and this limits the reach of 5 GHz frequencies inside homes. Agreement between who is getting the service and service provider Service to be provided Minimum up-time Response time (contacts) Start and End date Interconnection Security Agreement (ISA): Is a technical Agreement used on public sector. Ensures compliance with privacy laws and regulations What PII is collected, and why How the PII data will be collected, used, and secured To create a (PIA) - Privacy Impact Assessment, the organization needs to perform a (PTA) - Privacy Threshold Assessment on its infrastructure to locate personal information, what personal info. You can get to the time sequence of an event in all the logs quickly, have alerts and the ability to notify you based on a configurable trigger. Honeypots Emulate a web server, vulnerable machine purposely to attack; Inviting target to keep away from targets. What services are involved? Authored by Ian Neil, a world-class CompTIA certification trainer, this book is a best-in-class study guide that fully covers the CompTIA Security+ 601 exam objectives.Complete with chapter review questions, realistic mock exams, and worked solutions, this guide will help you master the core concepts to pass the exam the first time you take it. Example: Flood on Server room, base on data: one flood in about 10 years, 1/10 (0.1). Obfuscation To make harder an attacker reverse-engineer the code 7. Identical plaintext blocks create identical ciphertext blocks CBC - Cipher Block Chaining Popular mode of operation Each plaintext block is XORed with the previous ciphertext block Adds additional randomization Uses an initialization vector for the first block CTR (Counter) Block cipher mode / acts like a stream cipher Encrypts successive values of a 'counter' Plaintext can be any size, since it's part of the XOR e.g., 8 bits at a time (streaming) instead of a 128-bit block GCM (Galois/Counter Mode) Encryption with authentication Authentication is part of the block mode Combines Counter Mode with Galois authentication Minimum latency, minimum operation overhead Very efficient encryption and authentication Commonly used in packetized data Network traffic security (wireless, IPsec) SSH, TLS All block modes below uses IV, which ensures the output block is uniquely different A Binary Block is a plaintext converted into 16-bit, 64-bit or 128-bit binary ciphertext. To avoid this type of risk, maintain patch updates, stay on top of any announcements, check the dependencies of the third-party libraries using OWASP dependency checker. Remember that risk can never be completely eliminated. Improper Input Handling is a leading cause of critical vulnerabilities that exist in today's systems and applications. SMTP over TLS/SSL Encrypt the connection to the server Uses port 465 or 587 IMAP over TLS/SSL Creates a TLS encrypted tunnel Uses port 993 POP over TLS/SSL Creates a TLS encrypted tunnel Uses port 995 HTTP /S - Web HTTP is the foundation of data communication for the World Wide Web. Disabling Ports (can be done in the BIOS); Turn off legacy non-active ports to avoid vulnerable entry point. Stored Procedures Stored Procedures harden web apps; Is a piece of code, custom written by devs of the app and stored in the Database. Organizations use DLP to protect and secure their data and comply with regulations. Sniffer - Some type of software that grab all the data that is going in and out of particular interface. First half, 10,000 possibilities. This is easy to do in a VM environment. PORT STATE SERVICE VERSION 22/tcp open ssh OpenSSH 6.6.1p1 Ubuntu 2ubuntu2.13 (Ubuntu Linux; protocol 2.0) | ssh-hostkey: | 1024 ac:00:a0:1a:82:ff:cc:55:99:dc:67:2b:34:97:6b:75 (DSA) | 2048 20:3d:2d:44:62:2a:b0:5a:9d:b5:b3:05:14:c2:a6:b2 (RSA) | 256 96:02:bb:5e:57:54:1c:4e:45:2f:56:4c:4a:24:b2:57 (ECDSA) |_ 256 33:fa:91:0f:e0:e1:7b:1f:6d:05:a2:b0:f1:54:41:56 (ED25519) 80/tcp open http Apache httpd 2.4.7 ((Ubuntu)) |_http-favicon: Unknown favicon MD5: 156515DA3C0F7DC6B2493BD5CE43F795 | http-methods: |_ Supported Methods: GET HEAD POST OPTIONS |_http-server-header: Apache/2.4.7 (Ubuntu) |_http-title: Go ahead and ScanMe! 9929/tcp open nping-echo Nping echo 31337/tcp open tcpwrapped Service Info: OS: Linux; CPE: cpe:/o:linux:linux_kernel ... Packet-filtering Inspect data packets (drop or forward), such as the destination and originiation IP address, packet type, port number and other surface-level information. Security+ incorporates best practices in hands-on trouble-shooting to ensure security professionals have practical security problem-solving skills. It is primarily used to collect various device logs from several different machines in a central location for monitoring and review. Governance comes in the forms of laws, regulations, internal rules, and industry standards. Typo squatting - Mistype URL's (e.g. - facebook.corn) Domain Hijacking - the act of changing the registration of a domain name without the permission of its original registrant, or by abuse of privileges on domain hosting and registrar software systems. 14400 IN A 162.241.216.11 ;; Query time: 419 msec ;; SERVER: 192.168.1.1#53(192.168.1.1) ;; WHEN: Mon Mar 02 15:40:29 EST 2020 ;; MSG SIZE rcvd: 92 netcat TCP/IP swiss army knife; you can make any type of connection and see the results from a command line. Threat prevention - allow access by authorized users, prevent attacks Data security - ensure that all data transfers are encrypted; Protect the transfer of PII with DLP Containers Containers are self-contained applications that can communicate with network resources that have been explicity allowed Runs isolated instances of programs and services Can depend on each other, and can be configured to communicate with each other on a single host Runs a single program and all its dependencies, when the programs exists IaaS - Infrastructure-as-a-Service Basically virtual machines hosted by a cloud provider's infrastructure; Users simply connect to them via RDP (remote desktop protocol) or another secure remote connection protocol and use the as they would any other computer. Topological drawing Signature authoring Time frame for the interconnection Technical and security reviews from them Memorandum of Understanding/Agreement (MOU / MOA): Agreement used in public sector. Works like a DMZ but for private access. 10. Runs on port 389 Securing LDAP : LDAPS (LDAP Secure) A non-standard implementation of LDAP over SSL SASL (Simple authentication and Security Layer) Provides authentication using many different methods (e.g Kerberos) DNS - Domain Name System The Domain Name System (DNS) is the phonebook of the Internet. SOX - Sarbanes-Oxley Act, The Public Company Accounting Reform and Investor Protection Act of 2002. Network Segmentation Physical, logical, or virtual segmentation Devices, VLANs, virtual networks Performance High-bandwidth applications Security Users should not talk directly to database servers The only applicatons in the core are SQL and SSH Physical Segmentation - Switches Devices are physically separate Switch A and Switch B, and so on Must be connected to provide communication Direct connect, or another switch or router Web servers in one rack, Database servers on another Logical Segmentation using VLANs Separated logically instead of physically Cannot communicate between VLANs without a Layer 3 Device / Router Virtualizing everything When you get rid of physical devices Servers, switches, routers, firewalls, load balancers Instant and complete control Build a new network Route between IP subnets Drop a firewall between Drag and drop devices between networks Airgaps Remove any connectivity between components No possible way for one device to communicate to another No shared components Network separation Secure networks Industrial systems (SCADA, manufacturing) Military/governmental computer network/systems Removable media can jump the gap Network Access Control (NAC) Can be used to prevent hosts from connecting to the network unless they meet certain security requirements Wireless Network, Remote Access, VPN Access Control from wherever you are (inside or outside) Access can be based on many rules (by user, group, location, application etc) Access can be easily revoked or changed Posture assessment BYOD, Malware infections, missing anti-malware, unauthorized applications. Public Cloud Amazon S3, Microsoft Azure - Open for business Community Cloud Is make up of infrastructure from several different entitites wich may be cloud providers, business partners, and so on. What type of information is displaying to the end-user? Firmware OTA updates (over-the-air) - turn off Significant changes without connecting the device This may not be a good thing - the MDM can manage what OTA updated are allowed Camera use Can be use to take pictures of confidential information etc. Determine mission process. (e.g In a classroom of 30 students, what is the chance of two students sharing a birthday? PII - Personally Identifiable Information: Individual information (Name, birth, morther's name, biometric information, SSN, passport number) PHI - Protected Health Information: Not only Health information, PII may include on PHI. Under Rules Based Access Control, access is allowed or denied to resource objects based on a set of rules defined by a system administrator. Synchronizing the clocks becomes critical for Log Files, authentication information, outage details. e.g: AWS, Microsoft Azure, Digital Ocean, Google Cloud. See the example below, changing the last character '!' to '.' String: hello world! MD5 Hash: FC3FF98E8C6A0D3087D515C0473F8677 String: hello world. As a simple example, if someone connects an infected device to a network, it might be able to infect other devices on the network. Yagi antenna Very directional and high gain. VLANs A virtual LAN is any broadcast domain that is partitioned and isolated in a computer network at the data link layer. The exam cover six types of threat actor: Script Kiddies Can be external or internal Not Very sophisticated Runs pre-made scripts without any knowledge of what's really happening Hacktivists Hacker + Activist A hacker with a purpose - social change or a political agenda Can be sophisticated DoS, Web Site Defacing, Information Disclosure, Leaking private documents. SNMP - Simple Network Management Protocol Simple Network Management Protocol (SNMP) is an Internet Standard protocol for collecting and organizing information about managed devices on IP networks and for modifying that information to change device behavior. is stored and from whom the personal info is collected. "Read" or "Write" to the network Open a port and send or receive some traffic Listen on a port number Transfer data Scan ports and send data to be a port Become a backdoor Run a shell from a remote device stat stat can return the status of an entire file system, the status of the first hard disk and so on. Distributes work loads across multiple machines Servers can be added and removed Real-time response to load Performs constant health checks If a server disappears, it is removed from the rotation Virtualize the serves Scalability High-availability comes from elasticity Snapshots Affordable Hardware & Firmware Security Disk Encryption Full Disk Encryption (FDE) Encrypt an entire drive e.g. Windows - BitLocker Self-encrypting Drive (SED) Trusted Platform Module (TPM) Microchip built into a computer hardware that is used to store cryptographic information(public/private key). SIEM can collect all this data into one centralized location and correlate it for analysis to look for security and performance issues, as well negative trends all in real time. Vulnerability assessment at no time will ever actually try to grab the data. WPS Attack Prevention: Get rid of older routers Firmware updates Upgrade to newer wireless routers Hardening 802.11 Networks Survey installation issues Maintaining existing wireless networks Monitoring Define how to defend wireless clients Site Survey & Installation Survey Tools Find SSIDs Find MAC addresses Band, channels, and signals Document everything around 802.11 device Maintanance Wireless Networks Good Documentation SSIDs MAC addresses associated to WAPS AP locations Heatmaps Scanning WIDS - Wireless Intrusion Detection System - listen to what is going on inside the wireless network and help detect potential threats, or any abnormality. By design, honeynets are not authorized for any authentic uses. (Active Directory: Different Domains could be used in other domains in the same forest). Are the corporate applications installed? Are we building the product right? It's based on the concept of splitting up a communication system into seven abstract layers, each one stacked upon the last. Calculating Impact Determine how long the particular equipament going to last. Permissions - Windows NTFS permissions are granted to users and groups on folders and files. Scanning systems, gather information and identifying vulnerabilities are different than corrupt the entire database. In simple words: IDS: Notifies IPS: Acts to stop Firewall: Filters Sensors NIPS uses In-band sensor NIPS sensor must be installed in-band to your network traffic. Define Roles and Responsabilities. Triggering - Exceeding thresholds. (192.168.1.3) at 00:11:22:33:44:55 [ether] on enp0s10 ? Networks and Infrastructure Switches A network switch is networking hardware that connects devices on a computer network by using packet switching to receive and forward data to the destination device. The security controls come from the policies and standards. MD5 Hash: 3C4292AE95BE58E0C58E4E5511F09647 Message digest A message digest or hash, can be used to verify the integrity of a message by comparing the original hash to one generated after receipt of the message. tracert - Windows traceroute - Linux Take advantage of ICMP Time to Live (TTL) Exceeded error message The time in TTL refers to hops, not seconds or minutes. You'll also find this guide useful if you want to become a qualified security professional. Storage segmentation Dedicating a storage space for our applications Full Device Encryption Encrypt the entire storage of the device Some companies provides MDM solutions (e.g Google - Android: What applications people can install, security policies and so on) Mobile Device Deployment Models Any device connected to an organization's network represents a potential risk. (stills needs integrity and availability) Confidential Information: Limited to authorized viewing as agreed by the parties involved. With a little help of social engineering (such as sending a link via email or chat), an attacker may trick the users of a web application into executing actions of the attacker's choosing. (e.g Military/governmental computer network/systems) Virtualization NAT doesn't provide any security mechanisms. Alternative Processing Sites Different types of processing sites Alternative Business Practices Manual transactions, paper receipts, phone calls for transaction approvals These must be documented and tested before problem occurs After-action Reports (AAR) A clear and detailed documentation of everything that happened so that if it ever happens again you'll be ready to handle any form of business contingency planning. ~#: traceroute google.com traceroute to google.com (172.217.17.14), 64 hops max, 52 byte packets 1 192.168.1.1 (192.168.1.1) 4.960 ms 3.928 ms 3.724 ms 2 10.10.124.254 (10.10.127.254) 11.175 ms 14.938 ms 15.257 ms 3 10.133.200.17 (10.137.201.17) 13.212 ms 12.581 ms 12.742 ms 4 10.255.44.86 (10.255.45.86) 16.369 ms 15.100 ms 17.488 ms 5 72.14.201.214 (72.14.201.214) 13.287 ms 29.262 ms 16.591 ms 6 74.125.235.68 (74.125.242.68) 22.488 ms 74.125.235.84 (74.125.242.84) 13.833 ms * 7 74.125.252.202 (74.125.252.202) 24.147 ms 108.170.252.241 (108.170.25@.241) 26.352 ms 74.125.252.202 (74.125.252.202) 23.598 ms 8 108.170.252.247 (108.170.252.247) 31.187 ms 74.125.252.199 (74.125.252.199) 22.885 ms arp Address resolution protocol - caches of ip-to-ethernet Determine a MAC address based on IP addresses Option -a: view local ARP table ~#: arp -a ? Quantitative likelihood: based on numbers and data, can be more easy to measure anually. Twofish Block 128-bit 16 128, 192 and 256 bits Public domain algorithm. A directional antenna transmits in a single direction and receives signals back from the same direction. With the help of relevant examples, you'll learn fundamental security concepts from certificates and encryption to identity and access management (IAM). Secure OS Types Server OS - RedHat Server, Windows Server etc Built-in functionality Connections Workstation - Linux Ubuntu, Windows 10 etc Desktop version Workhorse Embedded Systems - Routers, CCTVs etc Appliances Their own OS / Usually a minimal OS Kiosk - e.g. Big Touch Screens on Museums, Mall etc Public device with limited function OS is tightly locked down Mobile OS - Apple iOS and Android OS Designed for touch screen phones and tablets Optimized for mobile hardware Picking an OS based on least functionality is a good security practice. Never trust data input - malicious users can attempt to circumvent the code. Disabling Unecessary Accounts - e.g. Windows default guest account, Duplicate accounts... Note: In addition, other properties, such as authenticity, accountability, non-repudiation and reliability can also be involved. Instead of numbers, use curves Uses smaller keys than non-ECC encryption ECDSA - Elliptic Curve Digital Signature Algorithm PGP - Pretty Good Privacy Popular asymmetric encryption OpenPGP Provide privacy and authentication for data communication. Primary entities Time frame Financial issues Management Service Level Agreement (SLA): Used in private sector. Manages the authorization better than RADIUS. (How long does data stick around? (e.g Local Coffee Shop Network) Whaling - Spear phishing tha targets senior management and executives Tailgating - (e.g leave computer unlocked, door etc) Shoulder Surfing - technique used to obtain private information by looking over the victim's shoulder, either from keystrokes on a device or sensitive information being spoken and heard, also known as eavesdropping Impersonation - Pretend to be someone you aren't Dumpster Diving - Used to retrieve information that could be used to carry out an attack on a computer network. Forensic procedures Collect and protect information relating to an intrusion Many different data sources and protection mechanisms RFC 3227 - Guidelines for Evidence Collection and Archiving A good set of best practices Standard digital forensic process Acquisition, analysis, and reporting Must be detail oriented Order of Volatility The order of volatility is a process that enumerates when, where, and how to gather the data/evidence before the data changes or disappears. Hides the servers Provides High security Protect the servers Handle DoS attacks Load balancing Caching Encryption acceleration Open Proxy A third-party, uncrontrolled proxy Can be a significant security concern Often used to circumvent existing security controls A significant security concern about open proxies, is that the owner of the proxy can add whatever they'd like into the network communication. It is a type of substitution cipher in which each letter in the plaintext is replaced by a letter some fixed number of positions down the alphabet. Formula: Single Loss Expectancy = Asset Value x Exposure Factor SLE = AV x EF Example (using data below): AV x EF = SLE €3100 1 €3100 SLE = €3100 (AV) x 1 (EF) = €3100 Annualized Rate of Occurrence (ARO) How many times per year you would expect a particularly negative event to occur, resulting in a loss of the asset. Security Concerns / Attacks Data Capture View communication Replay Attack Spoof the reader write your own data to the tag Denial of Service NFC - Near Field Communication Payment systems (Google Wallet, MasterCard partnership etc); Bootstrap for other wireless (helps with Bluetooth pairing); Uses an access token, identity 'card' (short range with encryption support) Security Concerns Remote capture Frequency Jamming (DoS) Relay/Replay Attack (MITM) Loss of RFC device control (e.g stolen phone) Bluetooth Security - Attacks ▯× Bluejacking - When bad actors connects with any Device that have Bluetooth enable by default. Backups Media for Backups External hard-drive Tape Cloud Offsite Backup Remote backup is good for natural disasters in general (fire, flood, water pipe burst, hurricane, tornado). (e.g BitLocker 1.2+); The OS relies on this hardware of root trust to check for low-level changes at boot up. 5. They are simply replaced. File system security Store files and access them Hard drives, SSDs, flash drives, DVDs Part of most OS's Accessing information ACL - Access Control List Group/User rights and permissions Can be centrally administred and/or users can manage files they own Encryption can be built-in The file system handles encryption and decryption Database security Databases have their own Access Control Username, password, permissions Encryption may be an option Most databases support data encryption Data integrity is usually an option No data is lost because of a fault Part of the database server operation Applications can provide a secure front-end Prevent SQL injections and inappropriate access to data Triple AAA Two most popular protocols of triple AAA is RADIUS and TACACS+, providing centralized Authentication, Authorization and Account management and registry logging for computers to connect and use a network service securely. Dictionary Attack Is a form of brute force attack technique for defeating a cipher or authentication mechanism by trying to determine its decryption key or passphrase by trying thousands or millions of likely possibilities, such as words in a dictionary or previously used passwords, often from lists obtained from past security breaches. There are two types of events: Network and Non-network events. Enterprise Solution Encrypts Massa storage Signing Disk Encryption BitLocker FileVault Enterprise Cloud Solutions OpenPGP Free Encrypted email PKI Support S/MIME GPG (GNU Privacy Guard) Free Toolset File and Disk encryption Certificates and Trust Certificates include a public key and at least one Digital signature. WPS Wi-Fi Protected Setup (WPS) - is a push button configuration, which enables the router WPS enable to another WPS device (wireless printers are the most common). Circuit-level firewall Quickly approve or deny traffic; verify transmission protocol (TCP) handshake (session). WAP is a bridge - extends the wired network on the wireless network (operates on OSI Layer 2 - data link) Not a wireless router! A wireless router is a router and a WAP in a single device. It also provides authentication for payload. Alerts - For notification if something goes bad. Gathering Evidence - data is of high integrity Control evidence - Maintain integrity Everyone who contacts the evidence Avoid tampering Label and catalog everything Chain of Custody Process Define the Evidence Document collection method Data/time collected Person(s) handling the evidence Function of person handling evidence (qualified person) All locations of the evidence (e.g inital collection, moved to law enforcement...) Forensic Data Acquisition Checklist of issues you should consider when you're performing Digital Forensics. 11. The telecommuter does not necessarily have the VPN connection set up at all times. It detects network traffic issues and alerts and administrator to these issues, also logging the events in the process. Incremental Backup Only backs up changes made from last backup Incremental more backup sets but smaller. (using Defense-in-Depth...) Identify resource requirements. The process of moving an application from the development environment to the production environment is called provisioning. 3) Risk Acceptance Means the organization has implemented controls and some risk remains (residual risk). Data Roles Data Owners: Legally responsible for the data, can be entity responsible. information) Discretionary Access Control (DAC): Used in most OS Owner of the data defines access Very flexible access control; Very weak security Role-based Access Control (RBAC): Access to resources is defines by a set of rules defined by a role in your organization/job function (Manager, Director etc) Administrators provide access based on the role of the user Rights are gained implicity instead of explicity In Windows, use Groups to provide role-based access control e.g. Admin Groups --> Rights and Perms, Sales Group --> Rights and Perms Attribute-based Access Control (ABAC): Users can have complex relationships to applications and data Access may be based on many different criteria ABAC can combine and evaluate multiple parameters Resource information, IP address, time of day, desired action, relationship to the data, etc Rule-based Access Control: Generic term for Following Rules Conditions other than who you are Access is determined through system-enforced rules System administrators, not users The rule is associated with the object System checks the ACLs for that object Rule examples Permitting access for an account or group to a network connection at certain hours of the day or days of the week Only Chrome browsers may complete this web form Rule Based Access Control (RBAC) introduces acronym ambiguity by using the same four letter abbreviation (RBAC) as Role Based Access Control. Data Exposure If you have data that is a part of your app some of that data has risk of exposure. PGP Certificates Symantec Corp. (e.g. Applying labels on the Government, they use Top Secret, Classified, etc). Executive Users: Concentrates on strategic decisions including policy review, incident response and disaster recovery. Residual risk is what risk remains after all mitigation and reduction strategies have been implemented. Name: certifiedhacker.com Address: 162.241.216.11 dig DNS lookup tool - Functions like nslookup, but allows for further functionality. And our job as developers is to reduce if not eliminate any risk of that data exposure especially if it's personally identifiable information (PII) or personal health information (PHI). Different precursors may give you better alerts Incident Response Plan Cyber Incident Response Team - CIRT This group is responsible for responding to security breaches, viruses and other potentially catastrophic incidents in enterprises that face significant security risks. MD5 128 bit hash SHA-1 160 bit hash SHA256 256 bit hash Examples: String: hello world! MD5 Hash: FC3FF98E8C6A0D3087D515C0473F8677 SHA-1 Hash: 430CE34D020724ED75A196DFC2AD67C77772D169 SHA256 Hash: 7509E5BDA0C762D2BAC7F90D758B5B2263FA01CCBC542AB5E3DF163BE08E6CA9 If you change a single character, the entire Hash value changes. Bring the system back online; how far back does data go? Non-Network Logs Operation System Events Host starting Host shutdown Reboot Service starting, stopping, and failing OS Updates Applications Events Application Installation Application starts, stops or crashes Security Events Logons Logons successes and failures Generic Log Structure: Date and Time Process/Source/ID Account associated/System Event Number Event Description Network Logs Network Events O.S. / System-Level Remote logon fail/not Events on Shared Applicaton/Resources Activity on Web Server (e.g. Apache) Activity on Firewall Application-Level Log Management Descentralized Log management In environments such as very small networks and don't have large infrastructure or in isolated network segments, descentralized log management is usually the norm. Why Protocol Analyze? OCSP - Online Certificate Status Protocol Is a more modern version of CRL that are used today, have a better performance. WannaCry ransomware hit on May 12, 2017 and the patch had been available since March 14. Because the power of the antenna is focused in a single direction, the directional antenna has greater gain than an omni antenna, and it can transmit and receive signals over greater distances. Hashes One-way encryption providing integrity. Common Web Application Attacks Source: OWASP 2018 | Source: ptsecurity Cross-site scripting (XSS) - Client-side script injected into trusted web site Reflected XSS - non-persistent, allow scripts to run in user input Stored XSS - script is stored in back-end database XML injections - Used to manipulate or compromise the logic of an XML application or service (e.g change the price of a product on ecommerce) Cross-site Request Forgery (XSRF, CSRF) - forces an end user to execute unwanted actions on a web application in which they're currently authenticated. (The paper you sign before entry a job position). Internet Key Exchange (IKE) – It is a network security protocol designed to dynamically exchange encryption keys and find a way over Security Association (SA) between 2 devices. Some media is much more volatile than others; Gather data in order from the most volatile to less volatile Memory Caches Routing tables ARP tables Data on the Disk Optical, flash drives Cache files, temp files Write blocks enabled tools Remotely logged data Web site data Remote file server logs Backups Backups Trends Low volatility takes time to gather data Chain of Custody The whole idea of Chain of Custody is to show good integrity of the evidence itself. Security testing like fuzzing. Most null pointer issues result in general software reliability problems, but if an attacker can intentionally trigger a null pointer dereference, the attacker might be able to use the resulting exception to bypass security logic or to cause the application to reveal debugging information that will be valuable in planning subsequent attacks. 6. The protocol which runs the internet is TCP/IP As long you're using legitimate IPv4 address or IPv6 Intranet If you're using the TCP/IP stack and making your own LAN or WAN = Intranet. Automation Strategies Automation is often used with various scans and updates based on configurable trigger. Look for servers that aren't authorized on the network. Protocol Attack SYN Flood/TCP SYN Attack A SYN flood is a form of denial-of-service attack in which

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