## LESSON: PowerShell, Shares, and Permissions

**Before you Begin**

As you review and prepare for this lesson, be cognizant that the content, especially PowerShell concepts may be challenging for most learners. This may be the first time they are exposed to scripting. As you may experience, additional demonstrations may be helpful for elaborating on PowerShell concepts which will require additional time. Maintaining your pace and schedule throughout the lesson is important. For this lesson and upcoming lessons, instructors are required to ensure the following activities are completed:

* Review the “Lesson Opener” and “Real World Scenario” with the learners prior to starting the module.
* Throughout the module, you will find “Consider the Real World Scenario” slides. Review the questions found on these slides, tie the concepts back to the scenario discussed at the start of the lesson as well as content you are presenting, and encourage the learners to share their thoughts.
* Ensure learners are given opportunities for breaks throughout the lesson. The pacing guide below provides recommended breaks. However, there are additional breaks added in the slide deck, please use them if needed.
* For each lesson, you will find a “Pulse Check” slide which is the opportunity for instructors to open a poll to gather feedback from the learners. Leave the poll open for about 1 minute and after you close the poll, share the results with the learners. Encourage the learners to share their thoughts. This information will help the instructors as well as the learners better understand where they are with regards to the lesson.
* Labs are to be demonstrated live for each module. The demonstration of labs is the top priority for the lead instructor. While demonstrating each lab, encourage students to participate and explore.
* At the end of each lesson, it is important to take a few minutes to review the key concepts for the lesson, provide guidance on what the learners can do to prepare for the next lesson, and wrap up with Q&A.

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### Summary

In this lesson, learners will explore PowerShell, Microsoft's versatile command-line interface. They will discover its power in automating tasks, managing configurations, and crafting scripts for administrative efficiency. PowerShell's superiority over CMD commands becomes evident as learners explore its vast array of cmdlets that enable them to create automated scripts. This lesson covers PowerShell's cross-platform capabilities, including remote Windows system administration and compatibility with Linux and macOS. Learners will navigate the learning curve associated with PowerShell's cmdlets scripting, emphasizing security and compatibility considerations. They will learn to leverage crucial PowerShell commands like Get-Command and Get-Help for discovering and learning about cmdlets. The lesson seamlessly transitions into understanding the SMB network protocol for sharing files, printers, and communication between networked systems. The use of backslashes to represent shared resource paths in a Windows network is clarified. Sharing files within a Windows environment is comprehensively covered, encompassing shared folders, PowerShell, OneDrive, and advanced sharing with permissions and access levels. The concept of NTFS permissions is introduced, highlighting how these permissions regulate access to files and folders, varying from read and write to modify and full control, based on user or group distinctions. Learners will grasp the essence of distributed file system (DFS), a tool that empowers efficient management and organization of shared folders across a network. The DFS Namespace value in offering a unified view of diverse file shares scattered across servers is explained. Additionally, the lesson delves into DFS Replication's role in ensuring up-to-date files across all DFS Namespace folders.

### Objectives

* Differentiate between PowerShell and CMD.
* Explain the purpose and functionality of PowerShell.
* Analyze the benefits and limitations of using PowerShell for system administration tasks.
* Apply PowerShell to practice examples.
* Explain the Server Message Block (SMB) Protocol.
* Identify the role of backslashes (\) in a path to a shared resource.
* Describe file-sharing methods and commands.
* Identify the types of NTFS permissions.
* Explain the process of assigning NTFS permissions.
* Explain the main components of the distributed file system.
* Analyze the benefits of using DFS to organize and manage shared resources within a network.

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### Lesson Activities and Teaching Strategies

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| Estimated Time | Lesson Portion | Directions |
| 5 min | **Lesson Opener:**  PowerShell, Shares, and Permissions | * Introduce learners to the importance of PowerShell, Shares, and Permissions in Microsoft Security system administration. |
| 5 min | **Real World Scenario:**  PowerShell, Shares, and Permissions | * Review the real world scenario challenge and inform learners that you will be constantly coming back to this scenario throughout the lesson to discover how to solve and apply concepts to this real situation. |
| 20 min | **Cyber Uncovered:**  PowerShell Fundamentals | * Introduce PowerShell as a Microsoft command-line interface (CLI) used for task automation, configuration management, and script creation. * Emphasize its capability to access the system, including Active Directory, for administrative tasks. * Compare PowerShell and CMD, highlighting PowerShell's task-based nature, cmdlets, object-oriented structure, and robust scripting environment. * Explain that CMD is an older batch language with simpler string-based operations. * Delve deeper into the differences, showcasing PowerShell's versatility, advanced features, and integration with system components, while CMD offers simplicity and legacy compatibility. * Explore the advantages of employing PowerShell for system administration tasks, including automation, a rich command set with built-in cmdlets, extensibility, integration with system components, and remote administration capabilities. * Discuss PowerShell's learning curve, compatibility issues with legacy systems, execution policy restrictions, potential complexity for simple tasks, and security considerations. * Present an overview of different PowerShell versions, from 1.0 to PowerShell 7, highlighting key changes and improvements. * Mention cross-platform support, open-source nature, and its gradual transition to replace PowerShell 5.1. * Focus on PowerShell 7 as a cross-platform and open-source version supported on Windows, macOS, and Linux. * Explain the shift from powershell.exe to pwsh.exe and its compatibility with Visual Studio Code (VS Code). * Be prepared to discuss the implications of the real world scenario presented at the beginning of class on network types and devices. There are specific prompts that you should ask learners to reflect on to apply this concept to the real world scenario. |
| 20 min | **Lab:**  Automated Active Directory Objects Creation | * Remind learners to use this lab to practice and apply the concepts they have learned throughout the day. * Learners will receive direct feedback on their lab to properly assess their knowledge and determine where they might need additional assistance. |
| 5 min | **Break** | * Share a timer on the screen so there is clarity as to when class will resume. Ensure cameras and microphones are disabled during the break. |
| 20 min | **Cyber Uncovered:**  PowerShell Practice | * Introduce learners to the fundamental syntax of PowerShell: VERB-NOUN, where verbs (e.g., Get, Set, Add, Clear, Write, Read) are combined with nouns (e.g., files, servers) to perform actions. * Explain the significance of verbs and nouns in constructing PowerShell commands. * Describe how Get-Command lists available PowerShell commands and cmdlets. * Explain the convenience of Tab key completion for cmdlets, filenames, variables, and parameters. * Introduce the Get-Help cmdlet as a valuable resource for obtaining information about PowerShell commands. * Explain the syntax of using Get-Help and its various parameters (e.g., -examples, -detailed, -full, -online). * Highlight the importance of updating help files with Update-Help. * Define execution policies and their role in governing the loading of configuration files and script execution. * Present the seven execution policy modes available in PowerShell. * Explain how execution policies enhance security by enforcing digital signatures for scripts. * Instruct learners on how to bypass execution policies using Set-ExecutionPolicy with the -exec bypass parameter. * Describe how information can be filtered using parameters to narrow down results. * Explain the concept of chaining commands together with the pipe operator (“|”) to pass output as input to the next command. * Introduce the Where-Object cmdlet for selecting specific objects based on property values. * Teach learners how to use the Format-Table cmdlet to customize and control the output presentation of data in a table format. * Introduce the New-Item cmdlet for creating system files, directories, and other items. * Provide examples of how New-Item can be used to create various types of items. * Explain the PowerShell Integrated Scripting Environment (ISE) included in Windows OS as a tool for scripting and debugging. * Describe the script file extension as ‘.ps1’ and its compatibility with various text editors. * Demonstrate how to write PowerShell cmdlet functions using any text editor. * Be prepared to discuss the implications of the real world scenario presented at the beginning of class on network types and devices. There are specific prompts that you should ask learners to reflect on to apply this concept to the real world scenario. |
| 25 min | **Lab:**  Basic PowerShell Commands | * Remind learners to use this lab to practice and apply the concepts they have learned throughout the day. * Learners will receive direct feedback on their lab to properly assess their knowledge and determine where they might need additional assistance. |
| 5 min | **Break** | * Share a timer on the screen so there is clarity as to when class will resume. Ensure cameras and microphones are disabled during the break. |
| 20 min | **Cyber Uncovered:**  File Sharing | * Explain the importance of file sharing in a networked environment and its role in enabling collaboration and resource access. * Provide a brief overview of SMB and its association with Microsoft Windows operating systems. * Present the key aspects and features of SMB. * Explain the concept of file and print sharing, the client-server model, authentication and access control, name resolution, security and encryption, version evolution, support for DFS, and cross-platform support. * Highlight the benefits and advantages of using SMB for file sharing and collaboration. * Discuss the default administrative shared folders and default domain controller shared folders in SMB. * Explain the significance of these default folders and their role in managing resources within a networked environment. * Introduce the use of backslashes (\) in representing the path to a shared resource in a network. * Explain how double backslashes are used at the beginning of a path, followed by the server name and shared folder name. * Discuss various file sharing methods and commands available in Microsoft Windows. * Focus on Shared Folders (SMB/CIFS), Advanced Sharing (SMB), OneDrive, and PowerShell commands. * Explain the purpose and usage of each method or command, highlighting their specific features and benefits. * Be prepared to discuss the implications of the real world scenario presented at the beginning of class on network types and devices. There are specific prompts that you should ask learners to reflect on to apply this concept to the real world scenario. |
| 5 min | **Pulse Check** | * After the poll is concluded, review the results with the learners. Encourage those in the red zone to attend office hours and/or to reach out to the instructors for assistance. |
| 5 min | **Break** | * Share a timer on the screen so there is clarity as to when class will resume. Ensure cameras and microphones are disabled during the break. |
| 20 min | **Cyber Uncovered:**  New Technology File System (NTFS) Permissions | * Explain the importance of file systems and permissions in Windows. * Compare and contrast NTFS and FAT file systems. * Highlight the features, capabilities, and compatibility of each. * Introduce NTFS permissions and their role in access control. * Emphasize the importance of data security and confidentiality. * Explain the different permission levels: Full Control, Modify, Read and Execute, Read, and Write. * Discuss special permissions in NTFS, including List Folder Contents, Read Attributes, Create Files/Write Data, Delete Subfolders and Files, Take Ownership, Traverse Folder/Execute File, and Full Control. * Explain the specific actions each special permission allows or denies. * Step-by-step process for assigning NTFS permissions to files and folders. * Demonstrate how to navigate to the Security tab, view existing permissions, and add/edit permissions for users or groups. * Explain the concept of permission inheritance from parent folders. * Discuss the role of explicit permissions in overriding inherited permissions. * Discuss the purpose and impact of deny permissions in NTFS. * Explain Access Control Lists (ACLs) and their role in managing permissions. * Be prepared to discuss the implications of the real world scenario presented at the beginning of class on network types and devices. There are specific prompts that you should ask learners to reflect on to apply this concept to the real world scenario. |
| 25 min | **Lab:**  Shares & Permissions | * Remind learners to use this lab to practice and apply the concepts they have learned throughout the day. * Learners will receive direct feedback on their lab to properly assess their knowledge and determine where they might need additional assistance. |
| 5 min | **Break** | * Share a timer on the screen so there is clarity as to when class will resume. Ensure cameras and microphones are disabled during the break. |
| 20 min | **Cyber Uncovered:**  Distributed File System | * Explain the importance of DFS in simplifying file and folder access, improving fault tolerance, and enhancing load balancing. * Define DFS and its role in organizing and managing multiple shared folders. * Highlight the benefits of DFS, such as simplified file access, load balancing, fault tolerance, and scalability. * Explain the concept of DFS Namespace and its purpose. * Describe how DFS Namespace creates a logical hierarchy of folders and links to manage shared folders as a unified namespace. * Discuss the benefits of DFS Namespace, including simplified file access, centralized management, flexibility, and load balancing. * Discuss the key components of DFS Namespace: Root, folders, and links. * Explain the role of each component in creating a logical hierarchy and connecting the logical namespace to physical shared folders. * Explain the benefits of DFS Replication, such as redundancy, fault tolerance, improved availability, and data consistency. * Describe the components of DFS Replication: Replication group, replicated folders, member servers, and replication topology. * Discuss replication schedule, conflict and collision handling, bandwidth throttling, and diagnostic and monitoring tools. * Highlight the benefits of DFS Replication, including redundancy, improved performance, efficient bandwidth usage, scalability, and data consistency. * Be prepared to discuss the implications of the real world scenario presented at the beginning of class on network types and devices. There are specific prompts that you should ask learners to reflect on to apply this concept to the real world scenario. |
| 5 min | **Lesson Closure** | * For this lesson, spend just a few minutes reminding the learners what the key ”take-aways'' were from the lesson and what they should do to prepare for the next module. Topics in your review should include discussion on why scripting is important in the field of cyber security. In addition, talk about how access control lists and permissions can be beneficial to mitigating threats. * You will be able to use the data collected in the pulse check to help with the lesson closure. Remind those learners that reported being in the “red zone” to take advantage of office-hours. * Recommend that the learners ensure they submit all of the assignments on-time to ensure the appropriate credit is provided to them. * Recommend that the students read-ahead and come prepared for the next lesson. * Q&A |
|  | **Additional Time Filler (if needed)** | * Kahoot * Discuss interview prep and questioning * Use breakout rooms for additional lab practice * Continue Real World Scenario Conversation |