## LESSON: Domain Name System

**Before you Begin**

At this stage of the extended program, we want to spend a few minutes at the start of class to go over the importance of reviewing the Career Outcomes module. You will find that for this module, you have additional time to dive a bit deeper into the details of DNS and should be able to map out the process of name resolution. In addition, at the end of class session, ensure that you set time aside to have the learners fill out the midpoint survey. The results of the midpoint will help both instructors receive feedback from the learners. 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.

**Summary**

In this lesson, learners will gain a high-level understanding of DNS (Domain Name System). They will explore its historical development, the importance of DNS for accessing websites and private networks, and the role of DNSSEC in enhancing security. Learners will also learn about DNS records, including primary and secondary DNS zones, and how to create forward and reverse lookup zones for comprehensive network mapping. Additionally, they will be introduced to troubleshooting tools, such as nslookup, ping, and ipconfig, to diagnose and resolve DNS issues. By the end of the lesson, learners will have a solid foundation of DNS fundamentals and the skills to effectively manage and secure DNS configurations.

### Objectives

* Describe how to construct a DNS query.
* Explain the different query types.
* Interpret DNS resolution processes and understand how they are used.
* Design a DNS zone configuration by selecting the appropriate zone types.
* Create different record types for effective DNS resolution in a given scenario.
* Configure forward and reverse lookup zones.
* Analyze and troubleshoot common DNS issues in a domain environment.

### Lesson Activities and Teaching Strategies

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| Estimated Time | Lesson Portion | Directions |
| 5 min | **Career Outcomes Content Reminder** | * Remind learners about the Career Outcomes module to ensure that they know that the materials are available and to complete the assigned modules. * This module will help the learners do the following:   + Identify skills and accomplishments employers want to see on a resume.   + Define transferable skills and help learners pinpoint relevant non technical skills for cybersecurity positions.   + Determine which professional accomplishments are resume worthy. * The Career Outcomes module can be found in week 2 of Microsoft Security System Administration. * Students can reach out to their SSM for questions and help if they need it. |
| 5 min | **Lesson Opener:**  Domain Name System | * Introduce learners to the importance of domain name systems. |
| 5 min | **Real World Scenario:**  Domain Name System | * 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. |
| 40 min | **Cyber Uncovered:**  DNS Fundamentals | * Provide an overview of DNS and its role in translating domain names to IP addresses. * Highlight the historical significance of DNS as a foundation of the internet. * Explain the hierarchical structure of DNS, including top-level domains and subdomains. * Introduce the types of DNS queries: Recursive and Iterative * Time permitting, dive deeper and explore the process of name resolution from client to recursive DNS server. Demonstrate visually the resolution process using iterative queries sent to the root, TLD and SLD authoritative name servers from that recursive DNS server. * Discuss the inherent lack of security in DNS and its vulnerability to attacks. * Highlight common security threats, such as DNS cache poisoning. * Explain the concept of DNS security (DNSSEC) and its role in enhancing DNS security. * Discuss the use of digital signatures to verify authoritative zone data and prevent data manipulation. * Demonstrate how to perform DNS lookups using the NsLookup command in a Windows environment. * Be prepared to discuss the implication 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 | **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. |
| 40 min | **Cyber Uncovered:**  DNS Zones and Records | * Provide an overview of DNS record types and their importance in mapping domain names to IP addresses. * Introduce the concept of DNS zones and their role in organizing DNS records for a domain. * Discuss different types of DNS zones, including forward lookup, reverse lookup, primary, active directory integrated, secondary, and stub zones. * Explain the characteristics and functions of each type of DNS zone. * Emphasize the role of DNS records in facilitating various internet services, such as hosting websites and handling email. * Present the top eight DNS record types and explain their purposes in brief, including A, AAAA, CNAME, MX, PTR, SRV, NS, and SOA. * Highlight the specific information each record type stores and its significance in DNS resolution. * Be prepared to discuss the implication 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. |
| 35 min | **Cyber Uncovered:**  DNS Configuration | * Explain the importance of configuring a DNS server for proper domain name resolution and network connectivity. * Highlight the role of forward and reverse lookup zones in the DNS server configuration process. * Instruct learners to open Server Manager and access the DNS tool through the Tools menu. * Guide them to navigate to the specific forward lookup zone for their domain. * Demonstrate the process of creating a new host record (A or AAAA) within the forward lookup zone. * Show learners how to verify the newly created host record within the Forward Lookup Zone folder. * Explain that no records are visible yet in the Reverse Lookup Zone folder. * Instruct learners to right-click on "Reverse Lookup Zone" and select "New Zone." * Guide them through the configuration steps, including selecting the zone type, specifying the network ID, and allowing dynamic updates. * Emphasize the importance of associating pointer (PTR) records with the reverse lookup zone. * Introduce common DNS troubleshooting tools, such as NsLookup, Dig, Ipconfig, and Ping. * Explain the purpose of each tool and its specific functions for diagnosing DNS-related issues. |
| 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. |
| 40 min | **Lab:**  Configuring DNS | * Remind learners to use this lab to practice and apply the concepts they 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 | **Midpoint Course Survey** | * Allocate 2 minutes to facilitate the completion of the Midpoint Survey. * Encourage learners to provide honest and constructive feedback about their learning experience. |
| 5 min | **Discussion Board** | * Allocate 3 minutesReview Discussion Board Slides and how it impacts students’ final grades. |
| 10 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. Learners at this point have trouble with recalling which protocols are used for specific services. Emphasize that DNS is a critical protocol used by TCP/IP hosts to resolve hostnames to IPs and IPs to hostnames. Ask learners what they believe the user experience would be on a network without DNS. * 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 |