Network Services

Module 8

Module Objectives

1. Explain the need for network services that reside at the Application layer of the TCP/IP networking model.
2. Discuss how DNS works, the role it plays and aspects of domain administration.
3. Discuss how mail works, the role it plays and aspects of mail administration.
4. Discuss remote interactive session services options.
5. Discuss how several popular file services work and aspects of file services administration.
6. Discuss how the "web" works and aspects of web site administration.

Module Guidance

1. Video	Introduces the module and addresses module objectives 1 and 2.	Duration: 10 minutes
2. Activity 1	DNS Administration	Duration: 15 minutes +
3. Video	Addresses module objective 2	Duration: 10 minutes
4. Activity 2	Mail Administration	Duration: 15 minutes +

5. Video	Addresses modules 4 and 5	Duration: 10 minutes
6. Activity 3	File Services Administration	Duration: 15 minutes +
7. Video	Addresses module 6	Duration: 10 minutes
8. Activity 4	Web Site Administration	Duration: 15 minutes +

Total Duration: 100+ minutes

All activities designed for this module are hands-on. The speed at which the activities can be completed will vary. Each activity has a milestone that should be attainable within the budgeted time. Additional milestones are provided in order to further enrich the services being developed.

Supplemental Materials

1. Handout: DNS Administration
2. Handout: Mail Administration
3. Handout: Interactive Session Services
4. Handout: File Services
5. Handout: Web Site Installation and Configuration
6. Handout: Basic Web Content Development and Management

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Module 8– Objectives and Key Instruction Points

Objectives:
Networking up to this point has been limited to Layer 3. The application protocols and related network services are the core of the value that networking and the Internet provide to users. The module is aimed at describing the most popular services and some of the related administration. The protocols and related services are sophisticated, and in-depth administrative treatment is beyond the scope of the cyber defense program. The guiding question is "What concepts and skills do students need to be successful building an IT environment suitable for the CDC?"

Video Segment 1 –

1. Network Services
    a. Enabling Services
        i. DNS
        ii. Directory Services – LDAP, X.500
        iii. NTP
        iv. Routing protocols
        v. Device management – SNMP, CMIP
    b. User Services
        i. Mail
        ii. Interactive Session Services
        iii. File Services
        iv. Content Services (Web)
        v. Other: Printing, Telephony
2. DNS
    a. Purpose
    b. Architecture
    c. Key Record Types
    d. Environmental Considerations
        i. "Split DNS"
            1. DNS in NAT environment
    e. Record lookup Tools
    f. Minimal administrative primer (Handout)
        i. Zone file structure
            1. Serial numbers
        ii. Administrative overview for Windows and FreeBSD
3. Mail
    a. Purpose
    b. Architecture
    c. Sending and Routing
        i. SMTP
        ii. Sendmail
    d. Client side – reading
        i. imap, pop3

    e. DNS & Mail
    f. Administrative concerns
        i. Mailboxes
        ii. Domain routing
        iii. Local delivery
        iv. Spam, mail relay, spoofing, malware, phishing
        v. Message authenticity and confidentiality
4. Interactive Session Services
    a. Purpose
    b. Architecture
    c. Options
        i. telnet
        ii. rlogin
        iii. ssh
        iv. rdp
5. File Services
    a. Purpose
    b. Architecture
    c. Options
        i. Periodic - FTP, SFTP
        ii. Continuous – NFS, SAMBA based services
    d. Administrative concerns
        i. Authentication
        ii. Access Control
        iii. Availability
        iv. Confidentiality
6. Web
    a. Purpose
    b. Architecture
    c. Protocols and Standards
        i. HTTP
        ii. HTTP + SSL
        iii. HTML
        iv. URI
    d. Administrative concerns
        i. Availability
        ii. Content integrity
        iii. User security and privacy
        iv. Content management
        v. Performance

Activities

Name	Objectives	Content ideas
Activity1	DNS Administration	Have the students establish a domain and configure the zone with basic records. The process

		could either assume a name and routable address for the public name server or students could register the specifics with an authority. An internal DNS zone should also be established, and could be done while registration is being processed.
Activity 2	Mail Administration	Have students develop a mail architecture and configure MX records and mail routing. Tests could be to send & receive mail locally as well as beyond the domain.
Activity 3	File services Administration	Have students configure Windows file shares, a NFS share & mount and practice using SFTP
Activity 4	Web site administration	Have students configure an intranet web server and populate it with some basic pages. Testing should be done with intranet clients.

Activity design
Activity1 Considerations:

Activity 2 Considerations:
Local mail exchange is a good test, but it is insufficient. Mail should be sent outside of the students' domain. Two options are that students from other schools become "pen pals" or that a playground service is provided. The playground service could consist of a mail domain and a receiving process. The process could autoreply acknowledging receipt of message. If mail routing is broken, the message to the playground receiver may not arrive or the reply may not be received. This may take some troubleshooting to sort out.

Handouts
Title:
Objectives:
Length: X pages
Notes:

Title: DNS Administration
Objectives: Explain basic DNS administration for Windows and Unix
Length: X pages
Notes:

Provide an annotated zone file. Be sure to explain structure of file. SOA record explanation is needed.
Explain location of zone files, configuration files, management interfaces for Windows and Unix (FreeBSD, Ubuntu).
What minimal records would we recommend playground IT environments contain. Explain why these records are being recommended.

Title: Mail Administration
Objectives: Explain basic mail configuration and administration for Unix
Length: X pages
Notes:
Key assumption regarding architecture need to be made. One assumption is that the mail infrastructure will be Unix based. Another handout will be needed if a Windows mail system needs to be supported.

Assume an MTA exists in the DMZ and an internal host serves the mailboxes. The mailboxes will be accessed by local mail readers like pine and elm. Support for pop3 and or imap should be provided. Assuming Microsoft still distributes a free client or students will use Mozilla's Thunderbird, it is reasonable students will gravitate towards a GUI reader instead of the text readers.
Documentation of troubleshooting techniques for sendmail, DNS and more may be necessary.

Title: Interactive Session Services
Objectives: Explain the configuration and use of telnet, ssh and rdc .
Length: X pages
Notes:
Telnet and ssh may be configured automatically during OS installation. Discuss how to disable telnetd. Discuss the sshd.conf file. Emphasize key sshd configuration settings that fall into sshd administration best practices. Discuss how to enable remote desktop services on Windows 7, 8 and Windows 2008. Since SFTP is dependent upon SSH, it would be good to point out sshd configuration setting related to sftp.

Title: File Services
Objectives: Explain how to configure NFS, Windows file sharing, SFTP
Length: X pages
Notes:
FTP is an optional protocol to support. If an FTP server is expected to be part of the CDC, then it should be discussed in this handout.

Title: Web Site Installation and Configuration
Objectives: Explain installation and rudimentary configuration of apache on Unix and IIS on Windows
Length: X pages
Notes:

If convenient, security best practices could be incorporated in this document. The alternative is wait until OS hardening to address web service security.

Title: Basic Web Content Development and Management
Objectives: Explain basics of web page development and content management for IIS and Apache
Length: X pages
Notes:
Web content is a big topic. Stick to using HTML for content design. Identify free web development tools.