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TQH: Interior IP routing
Online course specification

Target audience:
This "Interior IP routing" course is designed for those who are, or intend to be, involved in the planning, installation, or maintenance of Internet Protocol (IP) networks.

Course aim:
To describe the role, facilities, and operation of the various protocols that discover routes within an IP network.

Course level: Advanced
An explanation of PTT course levels is given at the end of this document

Pre-requisites:
An understanding of the principles of the Internet Protocol and routing. It is recommended that PTT's "IP Networks" online course is studied before attempting this course.

Course structure:
The course consists of the following 4 modules:

1. RIP route discovery
2. Principles of OSPF
3. OSPF facilities
4. EIGRP route discovery

Module 1: RIP route discovery

Module aim: Describe the use, operation and limitations of the distance vector routing protocol, RIP.

After completing this module, a trainee will be able to:

- review the principles of connectionless operation of a network based on the Internet Protocol (IP).
- introduce the principles of distance vector route discovery.
- describe the role of the Routing Information Protocol (RIP).
- describe the format of a RIP routing table.
- describe how routers build and update their routing tables in a network using RIP.
- explain how routing loops can be produced in a RIP-based network.
- describe and compare the use of split horizon, route poisoning, poison reverse, and hold down timers in reducing the possibility of routing loops.
- compare the facilities provided by RIP v1, RIP v2 and RIPng.

Module 2: Principles of OSPF

Module aim: Describe the use and operation of the link state routing protocol, OSPF.

After completing this module, a trainee will be able to:

- explain the principles and advantages of a link state routing protocol.
- describe the role of OSPF link state advertisements in building a router's topological database.
- describe the process of build a routing table from information in a topological database.

Module 3: OSPF facilities

Module aim: Describe the hierarchical routing and traffic engineering facilities offered by the link state routing protocol, OSPF.

After completing this module, a trainee will be able to:

- explain that the OSPF protocol allows routing tables to be built using other criteria apart from hop count.
- describe how the bandwidth cost metric is calculated.
- explain the significance of the OSPF-TE Traffic Engineering extensions to OSPF.
- Explain the relationship between, and respective roles of, RSVP-TE and OSPF-TE.
- explain the concept of an autonomous system (AS).
- explain that an OSPF-based AS can be divided into areas, giving advantages.
- explain the concept of a backbone area and a stub area.
- describe the role of an Area Border router and AS Boundary router.
- compare the facilities of the various versions of OSPF.

Module 4: EIGRP route discovery

Module aim: Describe the principles of operation of the EIGRP route discovery protocol and compare its benefits with those of OSPF.

After completing this module, a trainee will be able to:

- explain that EIGRP was designed by Cisco to overcome the limitations of their distance vector protocol.
- explain the role of, the relationship between, and the types of information held in, the three types of database maintained by EIGRP on each router in a network.
- explain that EIGRP routers only exchange routing information when a network change occurs.
- explain how EIGRP combines values of least bandwidth and total delay to compute the cost of a path.
- explain the concepts of, and relationship between, successor, feasible distance, feasible successor and reported distance.
- describe how a router using EIGRP recovers from the loss of a successor path.
- explain how EIGRP avoids routing loops.
- compare the characteristics and facilities of OSPF and EIGRP.

Course access requirements:
To access the course, a computer/tablet running a browser such as Chrome, Safari, Edge etc is required. The device should have an active Internet connection and a screen resolution of at least 1024x768.

Learning facilities:
This online course employs interactive simulations, hypertext links to an online glossary and multiple-choice question sessions to fully involve the trainee in the learning experience. Each module provides revision links to previously studied, relevant topics. A record of progress and level of achievement is recorded for each trainee. Once studied as a structured, assessed course, the content can be browsed for revision or reference.

PTT course levels:
PTT online courses are categorised by one of three levels according to the depth of treatment they provide:

1. **Introductory:**

   PTT Introductory courses are designed for those with no previous experience or knowledge of telecommunications. These courses provide an overview of telecommunications or discuss the fundamentals of electronic communications. The study of general science at secondary (high) school is a typical pre-requisite for PTT Introductory courses.
   PTT Introductory courses are suitable for those joining the telecommunications sector particularly those in an apprenticeship programme.

2. **Intermediate:**

   PTT Intermediate courses are designed for technicians and engineers requiring an understanding of a certain aspect of telecommunications. Those planning to study an Intermediate course should have an understanding of the basic principles of electronic communications.
   The depth of treatment provided by Intermediate courses is typically equivalent to level 3 of a UK national vocational qualification (NVQ). PTT Intermediate courses can be used to support the attainment of a Communications Technology NVQ at level 3.

3. **Advanced:**

   PTT Advanced courses are designed for those who require an in-depth treatment of a certain aspect of telecommunications. Such courses are suitable for system designers as well as those who will be responsible for the maintenance of the system described in the course.
   Those planning to study a PTT Advanced course should have a background in telecommunications, and an understanding of telecommunications fundamentals and the principles of the type of telecommunications system described in the course.

PTT
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