



**Course No:** (TWI-JUN-DCD)

**Length:** 3 days

### About this Course

This three-day course covers data center design background, historical and current challenges, today's requirements and drivers, and Juniper Networks recommended solutions. It presents designs to meet those requirements and overcome the identified challenges. The course provides an overview of various network technologies used in data center network designs, including Fibre Channel over Ethernet (FCoE), Internet Small Computer System Interface (iSCSI), MPLS, various types of virtual private networks (VPNs), Layer 2 technologies, and virtualization. To enhance the learning experience, the theoretical parts of the lecture materials are complemented with hands-on design case studies. The case studies provide further enhancements to student learning experiences, enabling students to apply principles of data center design best practices to specific examples.

### Objectives

After successfully completing this course, you should be able to:

- Describe the history and purpose of data centers.
- Describe requirements and drivers of data centers.
- Identify problems and challenges that data center architects and managers face today.
- Identify data center design considerations.
- Identify problems at the data storage tier.
- Describe data center storage technologies.
- Compare and contrast data center storage technologies.
- Describe data center storage networking protocols.
- Describe server convergence requirements.
- Describe the purpose of server consolidation.
- Describe server virtualization.
- Compare and contrast physical switches (pSwitches) and virtual switches (vSwitches).
- Identify the requirements for virtual firewalls.
- Describe server load balancing.
- Describe the Link Aggregation Control Protocol (LACP).
- Compare and contrast LACP and Redundant Trunk Group (RTG).
- Compare and contrast the Spanning Tree Protocol (STP), the Rapid Spanning Tree Protocol (RSTP), and the Multiple Spanning Tree Protocol (MSTP).
- Describe Virtual Router Redundancy Protocol (VRRP) functionality.
- Describe OSPF functionality.
- Describe BGP functionality.
- Describe Bidirectional Forwarding Detection (BFD) protocol functionality.
- Describe MPLS and its use in VPN deployments.
- Describe data center access tier requirements.
- Identify data center access tier design principles.
- Describe Virtual Chassis architecture.
- Identify the advantages of Virtual Chassis deployment.
- Compare and contrast Layer 2 and Layer 3 protocol deployment at the access tier.
- Describe data center aggregation-core tier requirements.
- Identify the benefits for aggregation tier and core tier consolidation.

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- Compare and contrast Layer 2 and Layer 3 protocol deployment at the aggregation-core tier.
- Compare and contrast methods of intelligent network segmentation.
- Identify the data center security tier challenges and requirements.
- Describe the security tier design principles
- Identify security tier elements.
- Describe how to secure data centers using virtual routers.
- Describe how to secure data centers using firewalls and other security elements.
- Describe how to simplify the data center security tier.
- Describe management tier requirements.
- Describe management tier best practices.
- Describe WAN edge requirements and design principles.
- Describe methods to optimize WAN interconnections.
- Describe how to accomplish traffic engineering using MPLS.
- Describe how to accomplish traffic engineering using routing policies.
- Describe how to accomplish class of service (CoS).
- Describe data center high availability requirements.
- Describe data center high availability elements.
- Compare and contrast business continuity and disaster recovery.
- Describe data center disaster recovery drivers.
- Describe cloud computing attributes and service modes.

### **Intended Audience**

This course benefits network architects, systems engineers recommending network design and solutions, and network consultants.

### **Course Level**

DCD is an intermediate-level course.

### **Prerequisites**

Students should have the following prerequisites:

- Networking knowledge.
- An understanding of the Open Systems Interconnection (OSI) reference model.
- An understanding of the TCP/IP protocol suite and TCP/IP routing protocols.
- An understanding of MPLS, Layer 2 VPNs, Layer 3 VPNs, and virtual private LAN service (VPLS) technologies.
- Some experience with the Junos operating system.

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## Course Contents

Day1

### Chapter 1: Course Introduction

### Chapter 2: Data Center Background

- History and Purpose of Data Centers
- Data Center Requirements and Drivers
- Problems and Challenges
- Data Center Design Considerations

### Chapter 3: Storage Technologies Overview

- Purpose of Storage and Problem Definition
- DAS, SAN, NAS, and CAS
- Storage Networking Protocols

### Chapter 4: Server Architecture Overview and Requirements

- Server Convergence and Consolidation Requirements
- Server Virtualization Overview
- Server Virtualization Challenge—Switching
- Server Virtualization Challenge—Security
- Server Load Balancing

### Chapter 5: Layer 2 and Layer 3 Protocols Deployed in Data Center Design

- Link Aggregation and RTG
- STP, RSTP, and MSTP
- VRRP
- Interior Gateway Protocols
- BGP
- BFD
- MPLS and VPNs
- Case Study 1—Part1: Consolidated Data Center for Retail

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Day 2

### **Chapter 6: Designing Data Centers—Access Tier**

- Access Tier Requirements and Design Principles
- Access Tier Physical Layout
- Virtual Chassis
- Deployment of Layer 2 Protocols at the Access Tier
- Deployment of Layer 3 Protocols at the Access Tier

### **Chapter 7: Designing Data Centers—Aggregation-Core Tier**

- Aggregation-Core Tier Requirements and Design Principles
- Aggregation Tier and Core Tier Consolidation
- Deployment of Layer 2 Protocols Between the Access and Aggregation-Core Tiers
- Deployment of Layer 3 Protocols Between the Access and Aggregation-Core Tiers

### **Chapter 8: Designing Data Centers—Security Tier**

- Security Tier Requirements and Design Principles
- Elements of the Security Tier
- Security Tier Layers—Virtual Routers
- Security Tier Layers—Firewalls
- Security Tier Layers—Other Elements
- Simplifying the Security Tier
- Case Study 1—Part 2: Consolidated Data Center for Retail

### **Chapter 9: Designing Data Centers—Management Tier Best Practices**

- Management Tier Requirements
- Management Tier Best Practices

Day 3

### **Chapter 10: Data Center Interconnectivity**

- WAN Edge Requirements and Design Principles
- Optimizing WAN Connections
- Accomplishing Traffic Engineering
- Accomplishing CoS
- Case Study 2: ABC Bank Merger and Acquisition

### **Chapter 11: Data Center Agility**

- High Availability Requirements
- High Availability Elements
- Disaster Recovery
- Cloud Computing

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