

Data Center Infrastructure Expert (DCIE)[®] 5-Day

Day 1

Data Center Overview

- Data Center History
- Data Center Definitions
- The Data Center Beast
- Data Center Downtime & Outage
- Present Data Center Standards
- Future of Data Center Standards

The Infinity Paradigm

- Application Ecosystem (AE)SM
- Core & Pyramid Models
- The Organization
- The 7 Abstraction Layers
 - Application Layer

- Platform Layer
- Compute Layer
- ITI Layer
- SFI Layer
- Site Layer
- Topology Layer
- Application Delivery Model (ADM)
- Application Delivery Infrastructure (ADI)
- Data Center Node (DCN)
- Logical Infrastructure
- Physical Infrastructure

Grading Systems

- Data Center Tiers & Classes
- Data Center Grade Levels
- AER, OER, EER, RER, SER
- Efficacy Score Rating

Data Center Development

- Data Center Tiers & Classes

- Data Center Development Process
- Data Center Phases

Site, Civil & Architecture

- Data Center Site Selection & Criteria
- Data Center Site Proximity, Hazard & Risks
- Data Center Topology
- Data Center Structure
- Data Center Construction
- Data Center Interior Fit-out
- Data Center Space Relationships
- Data Center CR, ER, MDA, HDA and ZDA
- Data Center Raised Floor System
- Data Center Grounding & Bounding
- Data Center Earthing

Power Systems

- Data Center Site Selection & Criteria
- Logical Electrical Flow
- DC, AC, W, AV Rates and Concepts
- Utility Service
- High Voltage Systems
- Switchgear
- Transformers
- Low Voltage Systems
- Uninterruptible Power Supply (UPS) Systems
- UPS Configurations
- Battery and Battery Types
- Generators
- Fuel Tanks
- Power Distribution
- ATS, STS
- Power Cabling
- Busbar Trunking System (BTS)
- EPO

- Grounding
- Lightning Protection System
- Alternative Power Sources
- EF, MF, EMF, EMI
- EMF & EMP Shielding

Day 2

Data Center Cooling

- Environmental Air
- Cooling Capacity
- Precision Cooling
- Direct Expansion (DX) Systems
- Non-DX Systems
- Cooling Methodologies
- Cold-Aisle / Hot- Aisle
- CRAC/CRAH
- Cooling Topologies:
 - Open CRAC Systems
 - Aisle Containment (Cold & Hot)
 - In-Row Cooling
 - In-Rack Cooling
- Cooling Towers
- Chillers
- Data Center Water Supply

Fire Protection

- Fire Types and Classes
- Smoke and Heat Detection
- Aspiratory Detection and Sensing
- Sprinkler Systems
- Gas Suppression Systems & Agents (FM200, Novec, etc.)
- Fire Prevention Technology
- Data Center Safety

Data Center Security

- Physical Infrastructure Security
- CCTV
- Access Control
- Mantraps
- Barbwires
- Security Protocols & Procedures
- IT Infrastructure Security

Data Center Structured Cabling

- Cabling Layout
- Patching & Termination
- Labeling
- Intelligence

IT Infrastructure

- System
- Storage
- Networks
- Virtualization & Cloud
- External Telecom Connectivity
- High Availability Designs

Data Center Efficiency

- Cost of Energy
- Power Usage
- Power Usage Effectiveness (PUE)
- Data Center Infrastructure Efficiency (DCIE)
- Applications and Hosting Models
- Applications
- Application Delivery Architecture
- App Tiers
- Colo vs Managed Hosting
- ASP Hosting
- Public & Private Clouds

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Monitoring and Management

- MMS, EMS, EPMS, BMS
- Temperature Monitoring
- Leak Detection
- Integration

Network Operation Center (NOC)

- Systems
- Procedures
- Control

Data Center Trends

- Latest Data Center Technology Trends
- Latest Data Center Industry Trends

Day 3

Intro to Data Center Engineering

- Engineering Importance
- Data Center Components
- Data Center Key players
- Tools and Techniques
- How and Where to Get Help

Data Center Engineering Process

- The Data Center EPS
- Phased Process
- Adaptive Need Conversion
- Understanding Application
- App Architecture
- ETT, TPS, Load and Complexity Factor

Data Center Classification

- Data Center Tiers and Classes
- Data Center Grade Levels
- Data Center Definitions and Options
- The Infinity Paradigm® Review
- Standard Requirements
- Designing with Limitations

Data Center Availability Engineering

- Operational Effectiveness
- Types of Availability
- Common Availability Figures
- Calculating Availability
- Redundancy
- Design Efficiency

Data Center Organizational Structure

- Data Center Stakeholders
- Open Process Framework
- Data Center Operations Management Team
- Data Center Business Manager
- Data Center Topology Manager
- Data Center Operations Manager
- Data Center Node Operations Manager
- Data Center Node Manager
- Data Center SFI Manager
- Data Center ITI Manager
- Data Center Floor Manager

- Data Center Site Manager
- Data Center NOC Manager
- Data Center S&S Manager
- Relationships, Duties and Limitations

Data Center Site and Building

- Site Selection Considerations
- Architectural
- Building Systems
- Walls, Structural Ceiling & Floor Systems

Day 4

Data Center Power Systems

- Electrical Systems – Macro View
- Power System Goals
- Electrical Concepts: PF, KW, KVA, KVAR
- 3-Phase Power
- Single Line Diagram (SLD)
- Power Transmission
- Utility Power
- Power Feed Classifications
- Break before Make
- Make before Break
- Topologies
- Unit Substations
- Circuit Breakers
- Switchgear
- Arc Flash
- Standby Generator
- Transfer Switches (ATS, STS, etc.)
- UPS Systems
- Power Distribution Unit (PDU)
- Busbar Trunking System (BTS)
- Calculating Power Requirements & Load

- Important Considerations
- Data Center Lighting Systems

Data Center Grounding System

- Effective Grounding System
- Equipment & Materials
- Methods and Disciplines

Data Center Cooling & Mechanical Systems

- Mechanical Systems Overview
- Latent vs Sensible Cooling
- Sensible Heat Ratio
- Cooling Cost Engineering
- Humidity Cost Engineering
- Heat Transfer Principles
- Environmental Design Conditions
- HVAC
- Cooling System Topologies
- Precision Air Cooling
- Chilled Water Cooling
- Direct Expansion (DX)
- Comparing Solutions and Designs
- Heat Transfer Fluids
- Temperature Differential
- CAV vs VAV Systems
- Cooling Measurements
- Cooling Layouts
- Cooling Efficiency

Day 5

Data Center Fire Protection

- Physical Infrastructure Security
- General Considerations
- Detection Systems
- Prevention Systems

- Suppression Systems
- Fire Concepts
- Fire Classifications
- VESDA and HSSD
- Halocarbon vs Inert Agents
- Fire Suppression Sizing & Calculations
- Water-based Systems

Data Center Structured Cabling

- Connectors
- UTP, FTP, STP Cables
- Singlemode vs. Multimode Fiber
- Data Center Cabling Topology
- Horizontal Cabling
- Backbone Cabling
- Cabling Security
- Structured Cabling Considerations

IT Infrastructure

- Data Center Telecommunication
- Data and Data Transmission
- DSx vs. Tx
- Telecom Categories and Capacities
- Optical Carrier
- SONET, OC, STS, SDH, STM
- Signal Hierarchy
- Dark Fiber

Information Technology

- Server Types and Components
- Storage Types and Media
- Storage Engineering
- RAID Methods
- Network Infrastructures
- Network Topologies

- Routing & Switching Protocols
- IGP, BGP, OSPF, VRRP, MPLS, ATM, Frame Relay
- IPv4 vs. IPv6
- OSI Model
- Load Balancing Types & Methods
- 6-Pack Architecture
- Firewalls and Intrusion Detection
- Virtual Private Networks
- VPN Protocols: IPsec, L2TP, PPTP, SSL
- Virtualization Types & Methods
- Cloud Infrastructure
- OpenStack

Data Center Safety & Security Systems

- CCTV, DVR, NVR, etc.
- Access Control Systems
- Mantraps & Airlocks
- Tracking & Tracing
- The Security Office
- IT Security
- Safety Principals