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CIOTP V1.9

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CIOTP™ LEARNING CHECKLIST

CERTNEXUS.COM CIOTP EXAM ITP-110 BLUEPRINT

1. THE IMPACT OF IOT

- [ ] 1.1 Identify & Describe The Possible Benefits That IoT Provides To A Business Or Organization
- [ ] 1.2 Identify & Describe The Possible Challenges That IoT Presents To A Business Or Organization

2. IOT ECOSYSTEMS

- [ ] 2.1 Identify Common IoT Terminology
- [ ] 2.2 Understand The Functionality Of The Typical Physical & Edge/Fog Computing Elements
- [ ] 2.3 Understand The Functionality Of The Typical Elements Of IoT Networks & Connectivity
- [ ] 2.4 Understand The Functionality Of The Typical Elements Of The Cloud & Cloud Platforms
- [ ] 2.5 Identify The Various IoT Market Sectors & Describe The Applications & Things Common To That Sector

3. SECURITY, PRIVACY, AND SAFETY

- [ ] 3.1 Understand Common IoT Security & Privacy Threats
- [ ] 3.2 Understand Common IoT Security & Privacy Countermeasures
- [ ] 3.3 Identify & Describe Common IoT Safety Concerns
- [ ] 3.4 Explain Common Safety Risk Management Approaches

4. THE IOT SYSTEM DEVELOPMENT LIFE CYCLE

- [ ] 4.1 Identify & Describe The Phases Of The IoT SDLC

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1. THE IMPACT OF IOT

1.1 IDENTIFY & DESCRIBE THE POSSIBLE BENEFITS THAT IOT PROVIDES TO A BUSINESS OR ORGANIZATION

- [ ] Identify & Describe The Possible Benefits That IoT Provides To A Business Or Organiation
- [ ] Increase Business Intelligence
- [ ] Enhance Existing Revenue Streams
- [ ] Create New Revenue Streams
- [ ] Enter & Create New Markets
- [ ] Reduce Costs
- [ ] Increase Productivity & Agility
- [ ] Increase Operational Efficiency
- [ ] Decrease Time To Market
- [ ] Reduce Natural Resources Usage
- [ ] Increase Opportunities For Innovation
- [ ] Improve Customer Eperience
- [ ] Increase Safety
- [ ] Improve Competitive Position

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1. THE IMPACT OF IOT

1.2 DENTIFY & DESCRIBE THE POSSIBLE CHALLENGES THAT IOT PRESENTS TO A BUSINESS OR ORGANIZATION

- Applicability Of Automation throughout The Organization
- Scalability Of Legacy Solutions To Modern Solutions
- Connectivity & Coverage Concerns
- Transformation From A Product-Oriented Business To An Everything-As-A-Service Business
- Cultural Transformation & Adoption Both In Business & Technology
  - Innovation
  - HR Practices & Processes (Hiring, Training, Advancement)
  - Skill Adjacencies
  - Management Commitment
- Security, Privacy, & Safety Concerns
- Cost Of Transition
- Digital Disruption
- Immaturity Of Standards, Regulations, & Oversight
- Retrofitting Modern Design Into An Eisting Infrastructure

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2. IOT ECOSYSTEMS

2.1 IDENTIFY COMMON IOT TERMINOLOGY

- [ ] Things
- [ ] Edge/Fog Computing
- [ ] Cloud
- [ ] Data Analytics
- [ ] AI (Artificial Intelligence)
- [ ] ML (Machine Learning)
- [ ] IIoT (Industrial Internet of Things)
- [ ] M2M (Machine To Machine)
- [ ] IoT Gateway

2.2 UNDERSTAND THE FUNCTIONALITY OF THE TYPICAL PHYSICAL & EDGE/FOG COMPUTING ELEMENTS

- [ ] Sensors
  - [ ] Position
  - [ ] Proximity
  - [ ] Sound
  - [ ] Temperature
  - [ ] Humidity
  - [ ] Accelerometer
  - [ ] Gyro
  - [ ] Magnetometer
  - [ ] Infrared
  - [ ] Camera
  - [ ] Voltage
  - [ ] Current
  - [ ] Pressure
  - [ ] Ambient Light
  - [ ] Radiation
  - [ ] Chemical
  - [ ] Motion

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2. IOT ECOSYSTEMS

2.2 CONTINUED

- Actuators
  - Solenoid
  - Motor
  - Servo
  - Relay
  - Switch
  - Stepper Motor
- Input/Output
  - ADC
  - DAC
  - I/O Modulus
- Power Sources
  - Backup Generators (Fixed Applications)
  - Generators/Alternators (Mobile Applications)
  - Battery
  - Solar
  - Wind
  - Water
  - Power Grid
- Location Awareness
  - GPS
  - Galileo
  - GLONASS
  - BeiDou

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2. IOT ECOSYSTEMS

2.2 CONTINUED

- Edge & Fog Computing
  - Edge/Fog Computing Capabilities
    - Application Processing
    - Real-Time Processing
    - HMI
    - Monitoring
    - Storage
    - Device Management
    - Safety & Security
    - Analytics/AI
  - Computing Elements
    - Things/End-Point Devices
      - Connect To Sensors & Actuators Directly To Collect Data
      - Optionally Connect To & Send Data To The Cloud Or An IoT Gateway
      - Receive & Act Upon Device Commands From The Cloud Or The IoT Gateway
    - IoT Gateway
      - Implementations (Vary By Industry)
        - Dedicated Hardware Device
        - Software Function
      - Aggregate End-Point Device Data
      - Connect To & Send Data To The Cloud
      - Optionally Perform Analysis Of Data
      - Receive Device Commands From The Cloud & Send To End Points

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2. IOT ECOSYSTEMS

2.2 CONTINUED

- Edge & Fog Computing (CONTINUED)
  - Hardware Platforms
    - Maker/Proof Of Concept Platforms
      - Arduino
      - Raspberry Pi
      - BeagleBone
    - Commercial MCUs & Application Processors
      - ARM
      - x86
  - Programming Languages
    - Java
    - Python
    - C/C++
    - Swift
    - Rust
    - Go
    - Assembly Language
    - Javascript
    - C#
  - Frameworks
    - Node
    - .NET
    - Angular
  - Operating Systems
    - Linux
    - FreeRTOS
    - Contiki
    - Wind River VxWorks
    - Android Things
    - ARM Mbed OS
    - Apple iOS

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2. IOT ECOSYSTEMS

2.3 UNDERSTAND THE FUNCTIONALITY OF THE TYPICAL ELEMENTS OF IOT NETWORKS & CONNECTIVITY

- Wired Protocols/Technologies
  - Industrial Ethernet Standards
    - PROFINET
    - EIP
    - EtherCAT
    - IEEE 1588 v2
    - TSN
  - Legacy Field Buses
    - PROFIBUS
    - Modbus
    - HART

- Wireless Protocols/Technologies
  - Near Range
    - NFC
    - Passive RFID
    - Active RFID
  - Medium Range
    - 802.15.4
      - Zigbee
      - Thread
    - Z-Wave
    - Bluetooth/BLE
    - 802.11 (Wi-Fi)
  - Long Range
    - Cellular
    - Satellite
    - Sigfox
    - LoRa/LoRaWAN
    - RPMA

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2. IOT ECOSYSTEMS

2.3 CONTINUED

- Applications/Messaging Protocols
  - MQTT
  - AMQP
  - HTTP/HTTPS
  - CoAP
- IoT Networking
  - IP Addressing
    - IPv4
    - IPv6
  - Routing & QoS
  - Encryption
  - SDN/NFV
  - Encapsulation & Bridging

2.4 UNDERSTAND THE FUNCTIONALITY OF THE TYPICAL ELEMENTS OF THE CLOUD AND CLOUD PLATFORMS

- Deployment Models
  - On Premise
  - Cloud
    - Public Cloud
    - Private Cloud
  - Hybrid

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2. IOT ECOSYSTEMS

2.4 CONTINUED

- Cloud Service Models
  - SaaS
  - PaaS
  - IaaS
- Cloud Platforms
  - Microsoft Azure
  - Amazon Web Services
  - Google Cloud Platform
  - IBM Cloud
  - Oracle Cloud
  - SAP Cloud Platform
  - Huawei FusionSphere
- Common Functions Of IoT Platforms
  - Device Management
  - Security Management
  - Data Management
- Virtualization Technologies
  - Hypervisors
  - Containers
- IoT Data Analytics
  - Techniques
    - Streaming Analytics
    - Predictive Analytics
    - Prescriptive Analytics
- IoT Data Analytics (CONTINUED)
  - Tools
    - Spark
    - Hadoop
    - Cassandra
- AI
  - Techniques
    - Machine Learning/Cognitive Computing
    - Computer Vision
    - Natural Language Processing
  - Tools
    - TensorFlow
    - Caffe
    - Theano
    - Torch

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2. IOT ECOSYSTEMS

2.5 IDENTIFY THE VARIOUS IOT MARKET SECTORS & DESCRIBE THE APPLICATIONS & THINGS COMMON TO THAT SECTOR

- Agriculture
  - Applications
    - Fuel Management
    - Fleet Management
    - Crop Management
    - Livestock Management
    - Weather Forecasting
    - Soil Optimization
    - Water Management
  - Examples Of Things
    - Harvester
    - Planter
    - Sprayer
    - Drones
    - Irrigation Systems
    - Livestock Monitor
- Security/Public Safety
  - Applications
    - Traffic Management/Control
    - Public Safety Monitoring/Control
    - Environmental Monitoring
    - Emergency Services (Police/Fire/EMS/HAZMAT)
  - Examples Of Things (Security/Public Safety)
    - Cameras
    - Traffic Sensors
    - Drones
    - Detectors (Smoke/Carbon Monoxide/Radon)
    - Radio/Communication Systems
    - Body Cameras
    - Vehicles
- Retail
  - Applications
    - Access Control
    - Security
    - Inventory Management
    - Vending & Payment
    - Proximity-Based/Location-Based Monitoring
      - Advertising
      - Directions
      - Crowd Control
    - Distribution Systems
      - Warehouse
      - Transportation
      - Logistics
      - Customer Analytics
      - Real-Time Pricing
      - Energy Management

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2. IOT ECOSYSTEMS

2.5 CONTINUED

- Examples Of Things (Retail)
  - Card Readers
    - POS
      - Cash Register
      - Mobile Payment Capture
    - Self-Serve Kiosks
    - BLE/NFC Beacons
    - Mobile Devices
      - Smartphones
      - Tablets
    - Digital Signage
- Transportation & Logistics
  - Applications
    - Fleet Management
    - Fuel & Engine Management
    - Operations & Maintenance
      - Diagnostics
      - Predictive Maintenance
      - Regulatory Compliance
    - Telematics
  - Examples Of Things
    - Aircraft
    - Vehicles
    - Locomotives
    - Radar Systems
    - Ships
    - GPS
    - Engines
- Manufacturing
  - Applications
    - Factory/Process/Machine Automation
    - Robotics
    - Asset & Inventory Management
    - Supply Chain Management
    - Predictive Maintenance
    - AR
  - Examples Of Things
    - PLC/PAC/CNC
    - Robots/Cobots
    - Motor Drives
    - Machine Vision Cameras
- Healthcare, Medical, & Life Science
  - Applications
    - Telemedicine/Remote Care/Remote Monitoring
    - Connected Hospital
    - Robotic Surgery
    - Patient Monitoring
    - Drug Supply Chain Monitoring
    - Tracking Laboratory Samples
    - Cold Chain Monitoring

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2. IOT ECOSYSTEMS

2.5 CONTINUED

- Examples Of Things (Healthcare, Medical, & Life Science)
  - Surgical Robots
  - Sleep Monitors
  - Pacemakers
  - Insulin Pumps
  - Glucose Monitor
  - CPAP Machines
  - Lab Equipment
- Consumer & Home
  - Applications
    - Home Automation
    - Home Security
    - Water/Gas/Electric Management
    - Connected Appliances
  - Examples Of Things
    - Thermostat
    - Smart Hub
    - Surveillance Cameras
    - Garage Door Opener
    - Refrigerator
    - Wearables
- Energy & Utilities
  - Applications
    - Smart Grid
    - Energy Management
    - SCADA
    - Automatic Meter Reading
    - Power Distribution Automation
    - Inspection & Preventive Maintenance
    - Flow Control
    - Energy Trading
  - Examples Of Things
    - Protection Relays
    - Connected Meters
    - Solar Panels
    - Wind Turbines
    - Water/Oil/Gas Pipelines
- Buildings
  - Applications
    - Automated Lighting
    - Waste Management
    - Building Management Systems
    - Surveillance & Security
    - Occupancy Management
    - Self-Aware Buildings
    - Air Quality Management

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2. IOT ECOSYSTEMS

2.5 CONTINUED

- Examples Of Things (Buildings)
  - Card Readers
  - Cameras
  - Toll Gates
  - HVAC Systems
  - Power Distribution Systems
  - Monitoring Devices (Environment, Presence, etc.)
  - Elevators/Escalators
- Defense
  - Applications
    - Cost Efficiency
    - Warfighter Effectiveness
    - C2
    - ISR
    - Intracommunications
    - Unmanned Systems
    - Human Performance
    - Logistics Tracking
    - Medical Tracking
  - Examples Of Things (Defense)
    - Tanks
    - Aircraft
    - Drones
    - Ships
    - Submarines
    - Connected Warfighter
    - Satellites
- Smart City
  - Applications
    - Route Optimization
    - Smart Parking
    - Smart Lighting
    - Traffic Management
    - Security & Threat Detection
    - Noise Management
    - Air Quality Control
    - Waste Management
    - Structural Integrity Monitoring
    - Public Transportation
  - Examples Of Things
    - Connected Vehicles
    - Traffic Lights
    - Street Lights
    - Cameras
    - Connected Manhole
    - Connected Garbage Receptacle
    - Light Rail/Subway Systems

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3. SECURITY, PRIVACY, & SAFETY

3.1 UNDERSTAND COMMON IOT SECURITY & PRIVACY THREATS

- Malware
  - Trojan Horse
  - Backdoor
  - Keylogger
  - Ransomware
  - Spyware
  - Worms
  - Viruses
- Network Attacks
  - DoS/DDoS
    - Botnets
  - MITM
  - Wireless Attacks
  - Spoofing
  - Pharming
- Password Attacks
  - Password Cracking
  - Password Sniffing
- Social Engineering
  - Phishing
  - Spear Phishing
  - Shoulder Surfing/Dumpster Diving
  - Impersonation
- Elevation Of Privilege
- Fuzzing
- Cross-Site Scripting
- Code Injection
- Buffer Overflow
  - SQL Injection

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3. SECURITY, PRIVACY, & SAFETY

3.2 UNDERSTAND COMMON IOT SECURITY & PRIVACY COUNTERMEASURES

- CIA Triad
  - Confidentiality
    - Data Encryption
  - Integrity
    - Blockchain
    - Nonrepudiation
  - Availability
    - DoS/DDoS Defence
    - High Availability
- AAA
- Firmware/Software
  - Secure Firmware Updates
  - OS Hardening
  - Secure Coding
  - Code Review/Scanning
  - Application Security
- Physical Security
- Vulnerability Assessment
  - Penetration Testing
- Data Anonymization

3.3 IDENTIFY & DESCRIBE COMMON IOT SAFETY CONCERNS

- Physical/Loss Of Life Accidents
  - Autonomous Vehicle Accidents
  - Aircraft Accidents
  - Transportation Accidents
  - Workplace Accidents
  - Industrial Disasters
- Infrastructure Outages
  - Mass Power Outages
  - Mass Internet Outages
- Biological/Medical
  - Water Supply Contamination
  - Failure/Hacking Of Diagnostic/Treatment Devices
- Supply Chain Disruption
  - Contamination Of Food Supply
  - Slipping In Counterfeit Or Substandard Parts Into The Supply Chain
  - Interruption Of Logistics

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3. SECURITY, PRIVACY, & SAFETY

3.4 EXPLAIN COMMON SAFETY RISK MANAGEMENT APPROACHES

- [ ] Hazard Classification & Analysis
- [ ] Root Cause Analysis
- [ ] Quality Management Systems
- [ ] CAPA
- [ ] Safety Certification

4. THE IOT SYSTEM DEVELOPMENT LIFE CYCLE

4.1 IDENTIFY & DESCRIBE THE PHASES OF THE IOT SDLC

- [ ] Initiation
- [ ] System Concept Development
- [ ] Planning
- [ ] Requirements Analysis
- [ ] Design
- [ ] Development
- [ ] Integration & Testing
- [ ] Implementation
- [ ] Operations & Maintenance
- [ ] Disposition