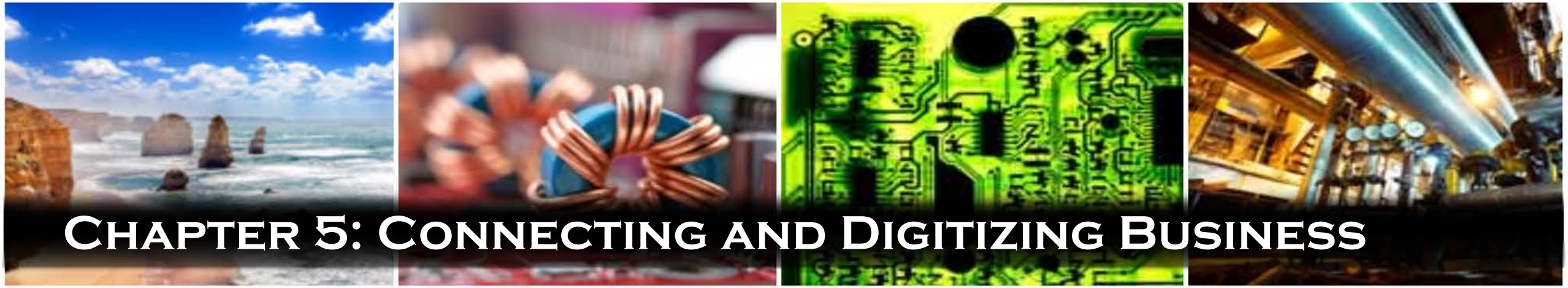

Chapter 5: Connecting and Digitizing Business

IoT Fundamentals
Connecting Things v2.0
Instructor Training

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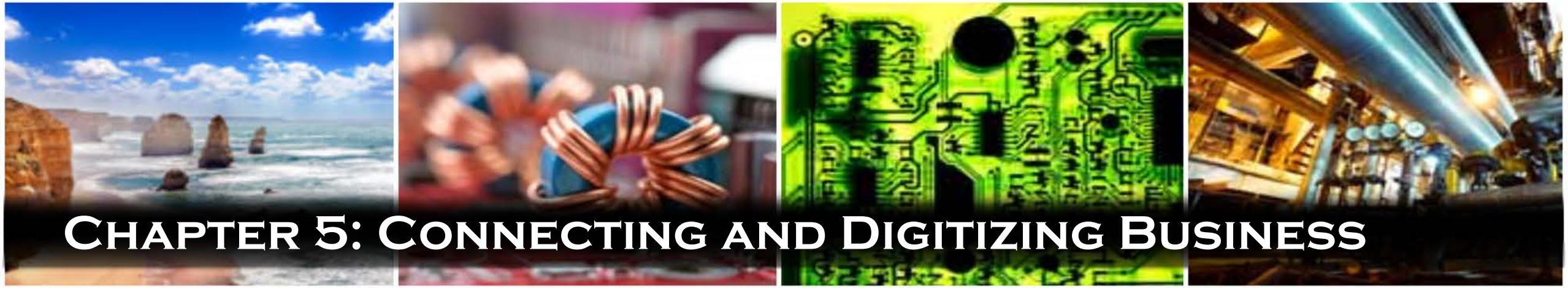

Chapter 5: Connecting and Digitizing Business

IoT Fundamentals
Connecting Things v2.0

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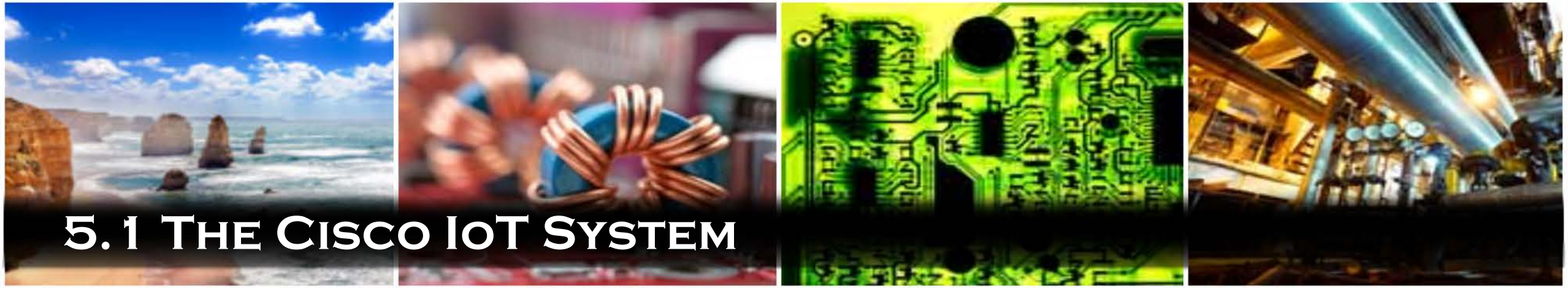
Chapter 5 - Sections & Objectives

- 5.1 The Cisco IoT System
  - Explain how Cisco equipment, software, and services enable IoT systems
- 5.2 Industrial IoT Applications
  - Explain the value of Industrial IoT Applications
- 5.3 IoT Systems in the Real World
  - Explain how IoT systems solve real world problems



5.1 The Cisco IoT System

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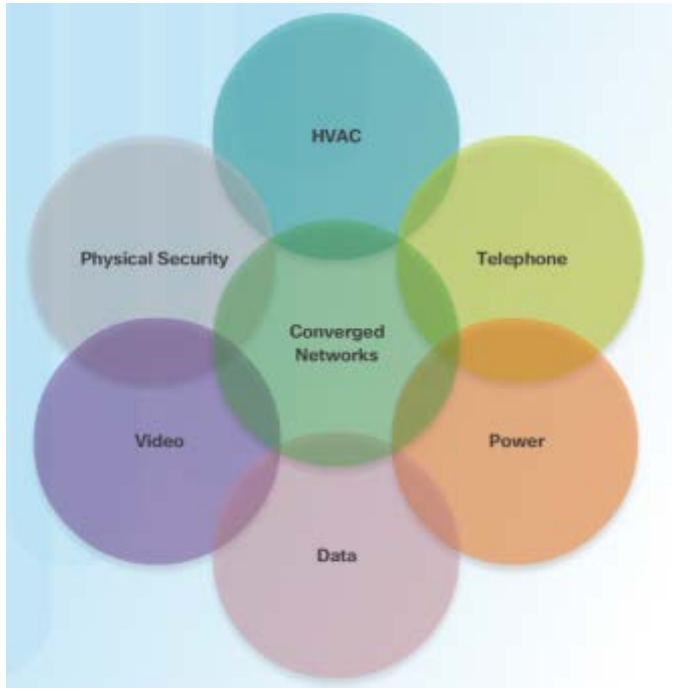
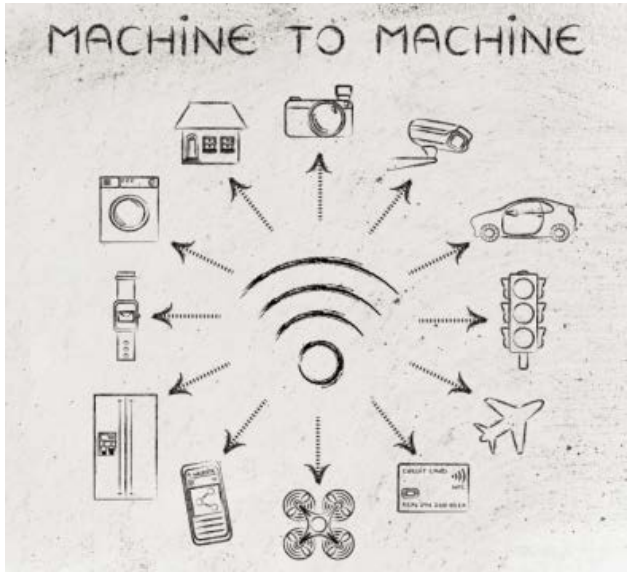
5.1.1 Cisco IoT System Overview

- **Connecting Things**
  - Allows for things to be accessible over the Internet that historically have not been
  - Home appliances, cars, sensors, and more
  - Industrial applications require a higher degree of reliability
- **The Converged Network and Things**
  - Many things are currently connected using a loose collection of independent networks
  - Independent networks are harder to incorporate into the IoT
  - Networks that would benefit from convergence:
    - Cars
    - Residential and office buildings (heating, ventilation, air conditioning (HVAC), telephone service, security, and lighting)
  - A converged network is a powerful network that includes comprehensive security, analytics, and management capabilities



5.1.1 Cisco IoT System Overview

- **Connecting and Digitizing Industry**
  - M2M enables communication between machines
  - M2M examples:
    - Cars with temperature and oil sensors communicating with an onboard computer
    - Homes with a smart refrigerator sending a message to a grocery store for the delivery of milk
- New challenges associated with the rapid growth of the IoT:
  - How to integrate millions of things from different vendors with custom applications
  - How to integrate new things into the existing network infrastructure
  - How to secure these new devices, each configured with varying levels of security



5.1.1 Cisco IoT System Overview

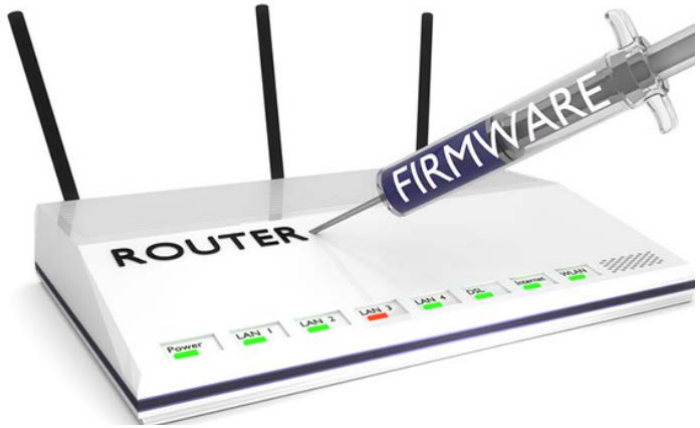
- **The Six Pillars of the Cisco IoT System**
  - Uses a set of new and existing products and technologies to reduce the complexity of digitization
  - The Cisco IoT System relies on six pillars:
    - **Network Connectivity** –
    - **Fog Computing** – allows data to be analyzed and managed at the location where it is generated
    - **Security** (cyber and physical) – very important for IoT, because it ensures that the data, control, and management planes are secure
    - **Data Analysis** –
    - **Management and Automation** –
    - **Application Enablement Platform** –
- **Supporting the IoT in Industry**
  - Network connectivity equipment varies depending on the type of network
  - Cisco IoT network connectivity pillar identifies devices that can be used to provide IoT connectivity to home networks and various industries

5.1.1 Cisco IoT System Overview

- **Industrial IoT Devices**
  - **Industrial Internet** - the integration of complex physical machinery with networked sensors and software including:
    - Industrial routers
    - Industrial switches
    - Industrial wireless
    - Embedded networks
  - These devices can support a variety of communication interfaces such as:
    - Ethernet
    - Serial
    - Cellular
    - WiFi
    - RF mesh
    - LoRoWAN
  - **Predictive maintenance** is the most common application of the Industrial Internet

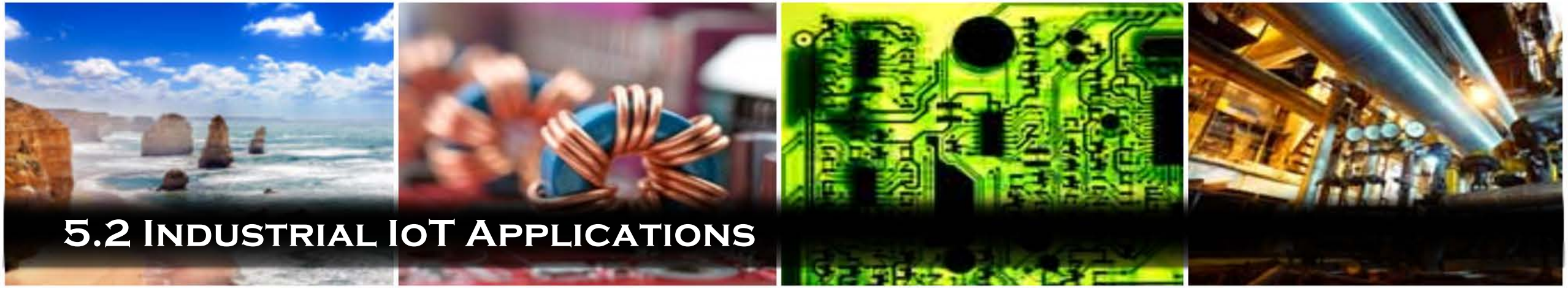
5.1.2 IoT Security

- **Control Plane, Data Plane, Management Plane**
  - Control plane is the brains of the device, used to make forwarding decisions.
  - Data plane is activities done to receive data from other devices and to forward them to the next device
  - Management Plane allows connection to modify a configuration or update software running on a device.
- **Securing Things Using the Cisco IoT System**
  - The IoT introduces new attack vectors
  - Cisco IoT System security pillar offers scalable cybersecurity solutions
  - These cybersecurity solutions include:
    - **Operational Technology (OT) Security** –
    - **IoT Network Security** –
    - **IoT Physical Security** – Video surveillance



5.1.2 IoT Security

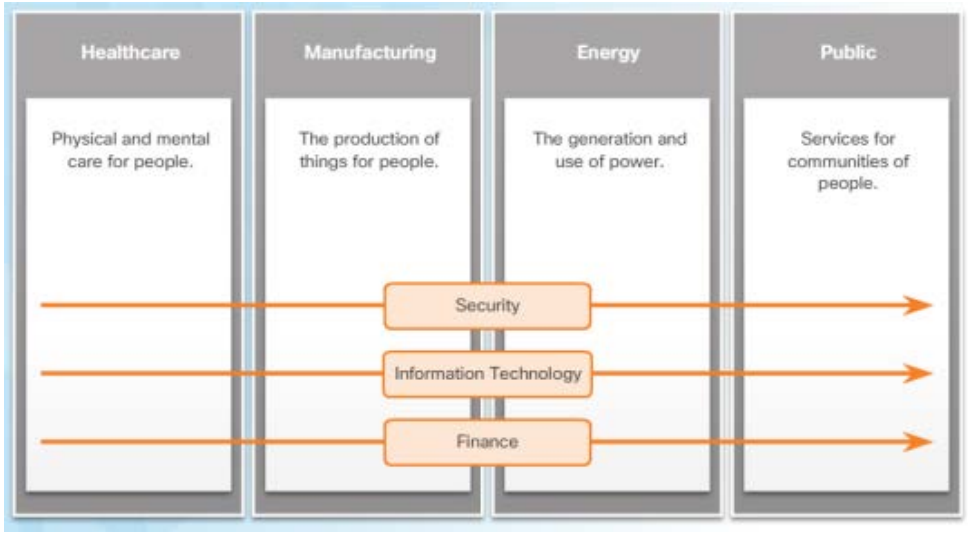
- **Securing the Control, Data, and Management Planes in IoT**
  - Securing the data plane relates to secure data as it crosses network devices
  - Securing the control plane relates to securing the network device itself with tools such as passwords and data encryption
  - Securing the management plane is secured by updating software and firmware with the latest patches
  - A few recommendations:
    - Make sure the new IoT device can be easily updated
    - Buy from a reputable manufacturer
    - Segment IoT devices to a different network or VLAN
    - Check for updates regularly
    - Default usernames/passwords must be changed
    - Limit management access od devices to trusted source
    - Turn off all unnecessary services



5.2 Industrial IoT Applications

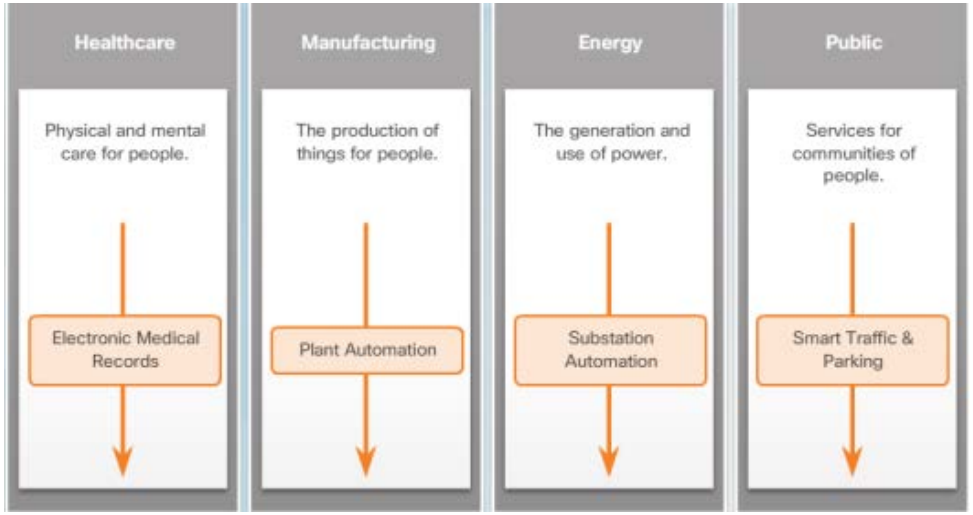
5.2.1 IoT Industries and Markets

- **Horizontal Markets**
  - Meet common or similar needs for a wide range of industries
  - Security, information technology, and finance companies are examples of industries that operate in horizontal markets



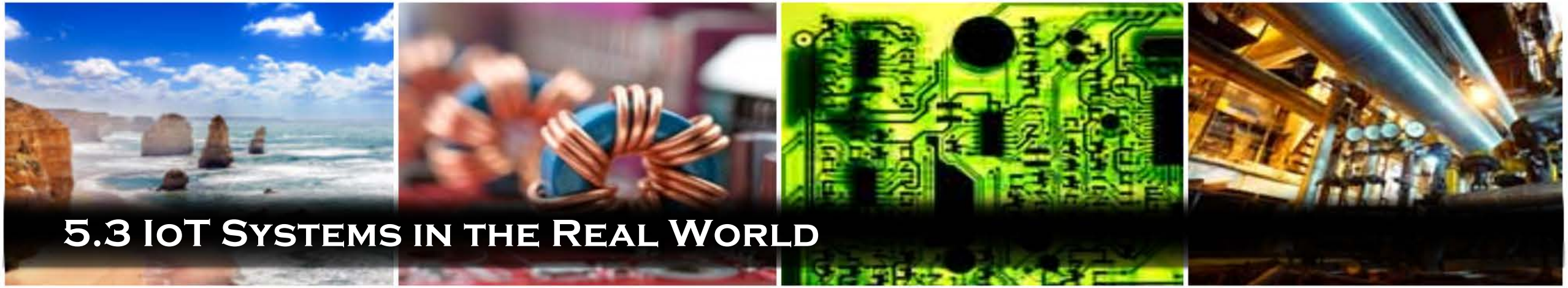
5.2.1 IoT Industries and Markets

- **Vertical Markets**
  - Offer goods and services to a set of customers with specialized needs:
    - Automotive – manufacturers, dealerships, repair shops
    - Banking – banks, brokerage houses, stock market
    - Education – K-12, higher education, trade schools
    - Healthcare – pharmaceutical companies, hospitals, lab facilities
    - Retail – clothing manufacturers, department stores, dry cleaners
    - Technology – manufacturers, installers, data centers



5.2.1 IoT Industries and Markets

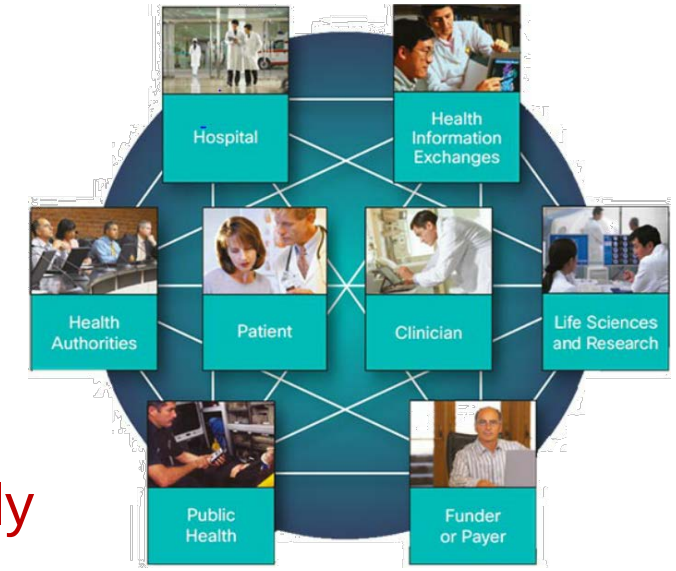
- **Integrated Solutions**
  - The IoT creates new opportunities for the interaction and relationship between a variety of connected devices
  - The IoT is about the integration of devices as a whole system, a holistic approach
  - The integration of devices and systems creates new business opportunities and customer experiences
- **The Industrial Internet**
  - Integration of complex machinery, sensors and software
  - Example: driverless car uses data from different systems to be driven safely
  - Most common application is predictive maintenance
  - Sensors is trains, planes, and large equipment keep track of hours of operation, machine output, environmental factors and determine when it needs maintenance



5.3 IoT Systems in the Real World

5.3.1 Connected Healthcare

- **Challenges in Healthcare**
  - Increasingly aging population
  - High-demand services
  - Shortages in key medical specialties
  - Rising healthcare costs
- Connected Healthcare uses the IoT to help healthcare providers reduce costs, improve productivity, and deliver better care to people in rural communities as well as in urban centers
- **Cisco Care-At-A-Distance Solutions**
  - Care-at-a-distance value propositions:
    - **Cisco Extended Care** - facilitates remote patient engagement and care team interactions
    - **Cisco WebEx for Healthcare** - facilitates remote collaboration, training, and patient education
    - **Cisco TelePresence for Healthcare** - links people globally for training, consultation, and specialized collaboration



5.3.1 Connected Healthcare

- Cisco Services for Connected Health enables experts to plan, build, and manage a network that meets clinical, business, and compliance needs
- **Cisco Clinical Workflow Solutions**
  - Cisco Virtual Patient Observation
  - Cisco Patient Connect
  - Cisco Healthcare Intelligent Contact Center
  - Cisco Context-Aware (Location-Aware) Healthcare
  - Digital Media Suite for Healthcare
- **Cisco Healthcare Management Solutions**
  - Cisco also provides healthcare provider management solutions:
    - Cisco Services for Connected Health
    - Cisco Medical-Grade Network

5.3.2 Smart Cities

- **Challenges Faced By Modern Cities**
  - Overcrowding
  - Increasing pollution
  - Increasing traffic congestion
  - Inadequate parking
  - Inefficient use of street lighting, water, and waste management
  - Need for continued growth
  - Pressure to provide safer and more secure cities
  - Budget and resource constraints
- City services provides location-based services to help city planners acquire near real-time data

5.3.2 Smart Cities

- **Cisco Smart+Connected Solutions**
  - More people are moving into cities is a major motivation for the development of Smart+Connected Cities systems
  - Customer segments of a city include its citizens, visitors, industry partners, businesses, and municipal operations
  - Smart cities must address the needs of these segments
- **Smart City Value Propositions:**
  - **Lighting** - Smart+Connected Lighting provides a standards-based system to help reduce city energy consumption and improve citizen vehicle compliance
  - **Operations Centers** -
  - **Parking** -
  - **Safety and Security** -
  - **Traffic** -
  - **Wi-Fi** –

5.3.2 Smart Cities

- Smart City - Hamburg, Germany
  - The city of Hamburg, Germany has transformed itself into a smart city
- **Cisco Smart+Connected Wi-Fi**
  - Connects people, data, devices, processes, and city services.
  - Value propositions provided by the Cisco Smart+Connected Wi-Fi to customer segments include:
    - Citizen Services, City Services, Business Services, City commerce, Infrastructure Management Services

5.3.2 Smart Cities

- **Cisco Smart+Connected Lighting**
  - A standards-based system for gathering a wide variety of data from the environment
  - Collects levels for humidity, CO2 and O2, UVA and UVB light, particulate matter, motion and seismic activity, video, sound, and more
  - Drastically reduce city energy consumption
  - Improve citizen vehicle compliance
  - Enhance situational awareness, real-time collaboration, and decision making across city agencies
  - Add intelligent, sensor-based IoT innovations to transportation, utilities, public safety, and environmental monitoring
- **Cisco Smart+Connected Parking and Traffic**
  - Smart cities can simplify parking and improve traffic flow
  - The Cisco Smart+Connected Parking solution provides citizens with real-time information about available parking
  - Also allows them to book spaces in advance using mobile applications

5.3.2 Smart Cities

- **Cisco Smart+Connected Operations Center**
  - Cities are increasingly looking for a customized, integrated, single-interface view of this data
  - The Cisco Smart+Connected Operations Center solution displays sensor, map, and video data across a single layout
  - It allows operators to control dynamic activities involving image processing, video feeds, data integration, and alerts

5.3.3 Smart Grids

- **Challenges in Energy**
  - Rapid increase in consumption is putting a strain on energy providers in many countries
  - There is also an increasing pressure to use low-carbon energy sources instead of fossil fuels
  - Different ways of thinking about power and the way that it is consumed are needed
  - Benefits the environment by enabling excess energy that is generated at homes and other sources to be distributed along with the power generated by utility companies
- **IoT Solutions for the Power Grid**
  - Utilities need a more modern and agile electric grid
  - Smart grid provides more complex interconnections between the producers, storage facilities, and consumers of electricity
  - Smart grid brings the notion of the consumers generating power for themselves and to the grid

5.3.3 Smart Grids

- **Cisco Smart Grid Solutions**
  - Cisco provides many smart grid solutions including:
    - **GridBlocks Architecture** –
    - **Connected Grid Services** – works with utilities to plan and design reliable and highly secure network architectures
    - **Field Area Network** –
    - **Transmission and Substation** –
    - **Grid Security** –
    - **Grid Operations** –

5.3.4 Connected Manufacturing

- **Challenges in Manufacturing**
  - Manufacturing must continually integrate new innovative technology into the existing plant infrastructure
  - Multiple siloed operational technology networks become a problem
  - Diversity in networks increases cost and complexity
  - That lack of integration leads to a broad range of issues, including:
    - Inefficient operations
    - Slow response times both in the factory and in the market
    - Poor quality control
    - High overhead
    - Compromised security
- **Characteristics of the Cisco Connected Factory Solution**
  - Network security
  - Operational efficiency and productivity low power requirements

5.3.4 Connected Manufacturing

- **IoT Solutions for Manufacturing**
  - IoT solutions connect the right people to the right information
  - Connected sensors provide a unique level of visibility into the factory operations and supply chain flow
  - Collected data contributes to identifying trends and relationships, revealing
    opportunities for improvement
  - For example, car companies now use sensor data to decide if conditions are favorable to paint a car

5.3.4 Connected Manufacturing

- **Cisco Manufacturing Solutions**
  - Cisco Connected Factory –
  - Cisco Connected Machines –
  - Cisco Secure Ops – addresses protection against risks, improves efficiency, and reduces factory site downtime
  - Cisco Connected Supply Chain –
  - Cisco Communications and Collaboration Tools –

5.3.4 Connected Manufacturing

- **Network connectivity includes:**
  - Industrial routers
  - Industrial switches
  - Industrial wireless devices
  - Embedded networks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