

# Everything Can be Automated

Introduction to the Internet of Things v2.0



# Sections & Objectives

- What Can be Automated?
  - Explain how digitization allows business processes to embrace automation.
    - Describe automation
    - Explain how artificial intelligence and machine learning impact automation.
    - Explain how intent-based networking adapts to changing business needs.

# What Can Be Automated?

# What is Automation?



- Automation is any process that is self-driven, reduces, and eventually eliminates, the need for human intervention.
- The IoT opens up a new world in which tasks previously requiring human intervention can become automated.
- Automation
  - Robots are used in dangerous conditions such as mining, firefighting, and cleaning up industrial accidents
  - used in automated assembly lines.
  - self-serve checkouts at stores
  - automatic building environmental controls
  - autonomous cars and planes.

## How is Automation being Used?

- Smart Home Automation
- Smart Buildings
- Industrial IoT and Smart Factories
- Smart Cities
- Smart Grid
- Smart Cars
- Stores and Services
- Medical Diagnosis and Surgery
- Aircraft Auto-Pilot



## Lab – Automating Everyday Events



### Lab – Automating Everyday Events

**Instructor Note:** Red font color or gray highlights indicate text that appears in the instructor copy only.

#### Objectives

Imagine daily activities that would make your life easier if they were automated.

#### Background / Scenario

Many activities performed daily are redundant and have the potential of being automated with advances in technology. Use your imagination or search videos to help you think of activities that could be made more useful if they contained intelligent sensors.

#### Required Resources

- none

#### Step 1: Activities to Automate

Think about your day in your home, school, or office. Are there any activities that you think would save you time if they were automated? As an example, if the smart refrigerator in your home had sensors to detect weight, it could determine that the milk carton was getting low and automatically order milk that is delivered to your home. Use the table below to list at least 5 activities and how each particular activity could be automated. If you use any videos to spark ideas for automation, list the name of the video and main URL after the table and potentially share with group members.

- List the activities that you selected and how the activity might be automated.

Activity	How would the activity be automated?
1.	
2.	
3.	
4.	
5.	
6.	


Answers will vary, but sample answers follow.

# When Things Start to Think

- Many devices now incorporate smart technology to alter their behavior under certain circumstances.
  - can be as simple as a smart appliance lowering its power consumption during periods of peak demand or as complicated as a self-driving car.
- Whenever a decision or course of action is taken by a device based on an outside piece of information, then that device is referred to as a smart device.



# Packet Tracer— Explore the Smart Home

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## Packet Tracer – Explore the Smart Home

(Instructor Version)

**Instructor Note:** Red font color or gray highlights indicate text that appears in the instructor copy only.

### Topology



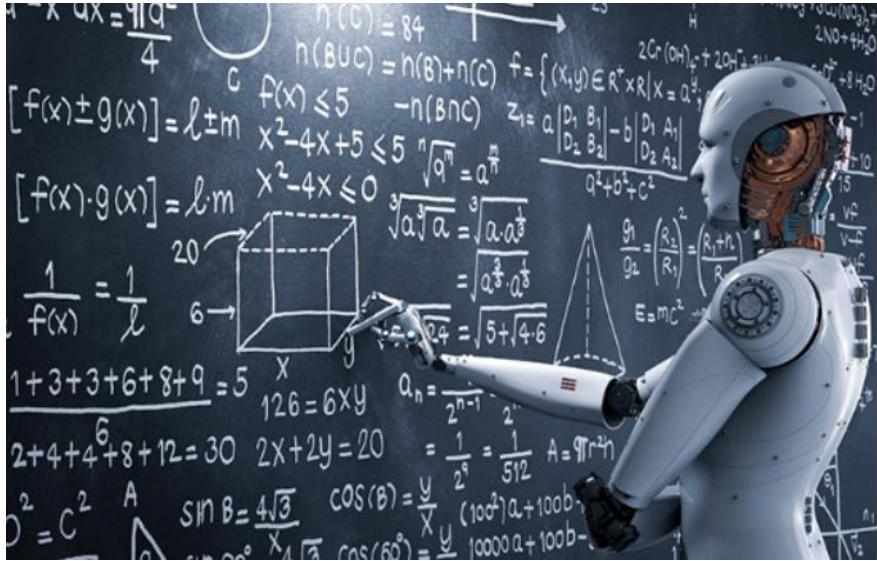
### Objectives

- Explore the Smart Home
- Analyze The Usage of Fog Computing in the Smart Home

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## What Is Artificial Intelligence and Machine Learning?



- **Artificial Intelligence (AI)** is the intelligence demonstrated by machines.
  - AI uses intelligent agents that can perceive their environment and make decisions.
  - AI refers to systems that mimic cognitive functions normally associated with human minds such as learning and problem solving.
- **Machine Learning (ML)** is a subset of AI that uses statistical techniques to give computers the ability to “learn” from their environment.
  - This enables computers to improve on a particular task without being specifically programmed for that task.


# Artificial Intelligence (AI) and Machine Learning (ML)

## ML and the IoT

- Common uses of ML technology include:
  - **Speech Recognition** – used in digital assistants.
  - **Product Recommendation** - Systems build up a customer profile and recommend products or services based on previous patterns.
  - **Shape Recognition** - Programs exist that allow crude hand-drawn diagrams and notes to be converted to more formal diagrams and text.
  - **Credit Card Fraud Detection** - A profile is constructed about the purchasing patterns of a client.
  - **Facial Recognition**



# Packet Tracer— Explore the Smart Home

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## Lab – 4.1.2.3 Design a Prototype of an AI Application (Instructor Version)

**Instructor Note:** Red font color or gray highlights indicate text that appears in the instructor copy only. Optional activities are designed to enhance understanding and provide additional practice.

### Objectives

- Part 1: Consider an IoT Application with AI/ML Technology
- Part 2: Design Components Required for an IoT Application with AI/ML Technology
- Part 3: Describe the Process and Operation for the IoT Application with Flowcharts

### Background / Scenario

With IoT devices and IoT networks getting popular, technologies for IoT devices are also improving rapidly. IoT devices are no longer limited to sensors and actuators; they may have the capability to think and act accordingly according to environment changes, thanks to the development of artificial intelligence (AI) and machine learning (ML). This lab is designed as a group project. The ideal group size is 3 to 4 people.

### Required Resources

Device with internet access

### Part 1: Consider an IoT Application with AI/ML Technology

In Part 1, the group members will list the functions and features of a smart home thermostat and controller device with capability of self-learning, making decision based on the environment changes, and acting accordingly.

**Step 1: List the desired features and function for such an device.**

\_\_\_\_\_

\_\_\_\_\_

The list will vary. Possible items may include these:

- Understanding commands from human beings, such as "Turn up/down temperature."
- Automatically adjusting house temperature according to environment changes
- Communicating with cloud computing for self-learning and algorithm improvement

**Step 2: List the factors that may influence the perception of temperature.**

\_\_\_\_\_

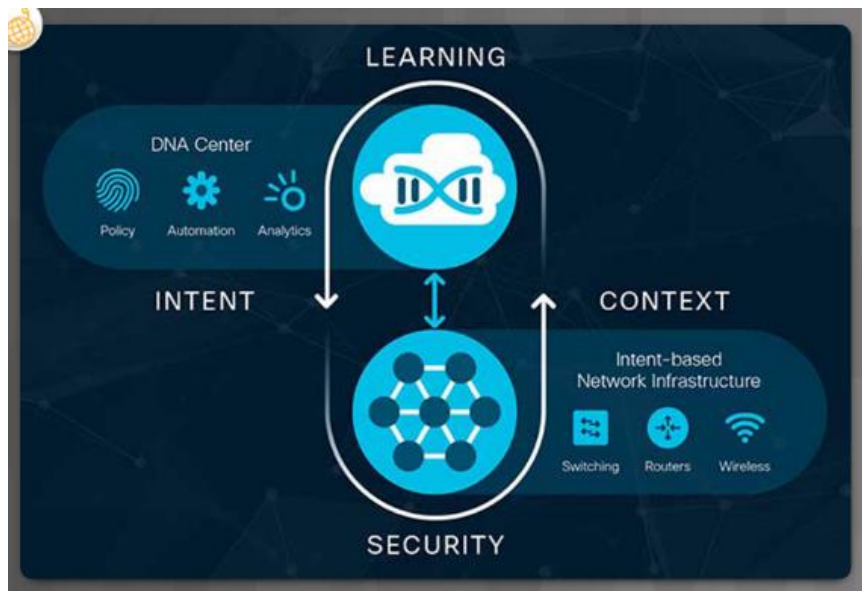
\_\_\_\_\_

Answers will vary. Possible items may include the following:

- What is a comfortable temperature? Different people may react differently to one set of temperatures.
- Current room temperature
- Measure humidity
- Proximity to the air vent
- Time of the day

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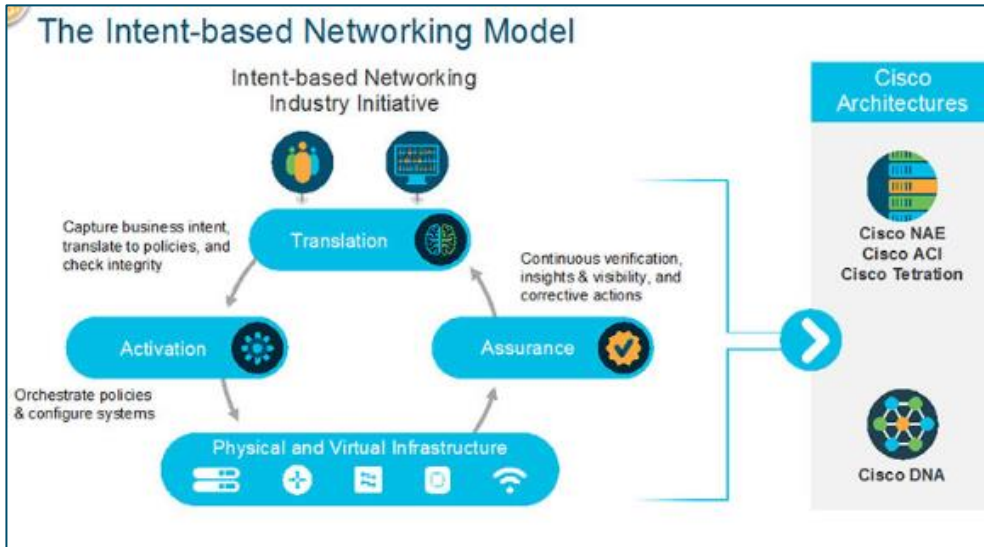
# What is Intent-Based Networking (IBN)



- IT industry creating a systematic approach to tie infrastructure management to business intent (IBN).
  - Business network must seamlessly and securely integrate IoT devices, cloud-based services, and remote offices.
  - Network must secure these new digital initiatives from the ever-changing threat landscape.
  - Network must be responsive enough to quickly adapt to changes to security policies and procedures, business services and applications, and operational policies.

# Intent-Based Networking

## How are ML, AI, and IBN Linked?



- Intent-based networking harnesses the power of automation, AI and ML to control the function of a network to accomplish a specific purpose, or intent.
  - Network is able to translate the intent into policies and then use automation to deploy the appropriate configurations required.
- Intent-based networking model consists of three key elements:
  - **Assurance** - end-to-end verification of network-wide behavior.
  - **Translation** - ability to apply business intent to network configuration.
  - **Activation** - occurs after the intent has been specified and the policies created.

# Use Cases for Intent-Based Networking

Video - The Network Intuitive



<https://www.cisco.com/c/en/us/solutions/enterprise-networks/index.html>

- Intent-based networking allows the company to focus on business goals.
  - Provides an automated system that understands what the organization needs and then makes it happen.
  - Cisco Digital Network Architecture (Cisco DNA) is an example of an intent-based network.
    - Open, extensible, software-driven architecture.
    - Accelerates and simplifies enterprise network operations, while lowering costs and reducing risks.

## Lab – Researching Intent-Based Networking (IBN)



### Lab – 4.1.3.4 Researching Intent-Based Networking (IBN) (Instructor Version)

**Instructor Note:** Red font color or gray highlights indicate text that appears in the instructor copy only.

#### Objectives

- Part 1: Explore the Cisco Intent-Based Networking (IBN) website
- Part 2: Introduction to Intent-Based Networking with Cisco DevNet
- Part 3: Explore IBN Community Requests and Share Your Own

#### Background / Scenario

Today the network connects everything. What if the network could constantly adapt, protect, and notify based off the intent of the business owner? With an Intent-Based network, based on an open platform, the network can capture business intent and align the end-to-end network with that intent to bridge the gap between what the business needs and what the network delivers.

#### Required Resources

- Computer with Internet Access

#### Part 1: Explore the Cisco Intent-Based Networking (IBN) website

In Part 1, you will be introduced to an overview and multiple use cases of Intent-Based Networking with Cisco. While reading through this site and watching the embedded videos you'll learn about human intent being being transformed into machine policy implementation. Click on the link below to access the Cisco IBN solution website.

<https://www.cisco.com/c/en/us/solutions/Intent-Based-networking.html#-stickynav=6>

#### Step 1: Read through the Cisco Solutions website above and answer the following questions:

What is Intent-Based networking (IBN)?

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