

OVERVIEW OF

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**SMART HOME AUTOMATION**

# WHAT IS A “SMART HOME?”

- ▶ One that uses:
  - ▶ sensors;
  - ▶ controls;
  - ▶ integrated through communications;
  - ▶ can “talk” to other devices;
  - ▶ can send notifications and receive remote commands.

## PREVIOUS ATTEMPTS

- ▶ Earlier systems that you might have used to make your home “smarter” include:
  - ▶ lamp timers that you might have used to turn lights on and off when on vacation;
  - ▶ outdoor lights with a light sensor or a motion sensor.
- ▶ Aren't these things “smart?” Not really, since your motion sensor lights can't trigger other actions, and your light timer can't be adjusted remotely...

## A DAY IN THE LIFE IN A SMART HOME

- ▶ Fifteen minutes after sunrise, the outside porch lights turn off (according to the sunrise time each day).
- ▶ The smart thermostat changes the comfort settings to set the temperature before we wake up.
- ▶ When I come out to the kitchen, I tell Alexa "Turn on the Kitchen Lights."
- ▶ After breakfast, when I leave for the office, I tell Alexa to "Turn everything off" which turns off all of the lights, etc.

- ▶ As I leave through the front door, I lock using the keypad. I'm not even carrying a key. The door has a sensor that would turn on the porch lights if it were dark out. The smart lock reports that the lock was opened, then locked again to the smart home hub. It could send an alert if the door remained opened or unlocked. It can also be used to trigger actions in a home security system.
- ▶ The smart thermostat senses that the house is empty, and sets back the temperature to save energy.
- ▶ During the afternoon, I receive a package delivery. My NetGear Arlo camera on the front porch detects motion, records the event, and sends me a notification. I can use the app on my smart phone or tablet to watch a live video/audio feed, communicate with the delivery driver using the mic and speaker built into the camera, or replay the video remotely.

- ▶ Thirty minutes before sunset, the outside front porch lights turn on (according to the sunset time each day) so the lights are already on when I arrive home.
- ▶ After working all day, when I return home, the smart thermostat senses that I have returned home, and resumes the preset schedule for the temperature.
- ▶ When I open the door to the garage to get something for dinner from the freezer, the Garage Light turns on automatically.
- ▶ When I close the freezer door, it doesn't shut all of the way... The door sensor alerts me by email or text message after five minutes, so that I can get it shut tightly.
- ▶ Ten minutes after I came in from the garage, a timer turns off the light.

- ▶ I tell Alexa to “dim” the kitchen lights to 100% while I’m cooking, and ask her to “play some jazz music” as well. I also ask Alexa to set a timer for twenty minutes.
- ▶ I have Alexa turn off the kitchen lights, and dim the dining room lights to 30% when I’m ready to sit down to dinner.
- ▶ I have used up a couple of items from the fridge and the pantry, so I ask Alexa to add margarine and macaroni to my shopping list. I can ask Alexa what is on my shopping list any time, and she will tell me what is on the list, I can also see it using the “Todoist” app on my smart phone when I’m at the grocery store, and check items off as I pick them up. The same list is shared with my wife.

- ▶ After dinner, I go downstairs to my office in the basement, carrying my backpack, iPad, and a cup of coffee, so my hands are full. The motion detector in the stairway turns on the lights in the stairwell. As I turn the corner into the office, another motion detector turns on the lights in my office. The smart thermostat sensor in my office detects that the room is occupied, and uses that sensor to control the HVAC.
- ▶ After ten minutes of inactivity, the lights in the stairway turn off automatically.
- ▶ Later in the evening, I leave my office and go back upstairs. After thirty minutes of inactivity in my office, the lights turn off automatically, as well as the lights in the stairway.



- ▶ When I sit down on the couch in the family room, the smart thermostat sensor detects that the family room is occupied, and uses that sensor to control the temperature.
- ▶ I turn on the TV, but realize that I left the remote control for the satellite dish on the kitchen table... I just ask Alexa to "Turn on channel 9" to switch channels.
- ▶ I hear the dogs barking outside, and open the back door. The patio light comes on automatically, with a 30-minute timer to turn it off after I close the door. If I had turned the lights on manually using the switch, the lights would stay on, instead of using the timer.

- ▶ At 10pm, the lights in the kitchen dim to 25%, so that it's not so bright.
- ▶ After the news, I get ready for bed. Before getting into bed, I tell Alexa to "Turn Everything Off" to make sure that all of the inside lights and ceiling fans are turned off.
- ▶ The smart thermostat "sets back" the temperature to save energy.

**TIME FOR A DEMO!**

# DEMONSTRATION

- ▶ Mac Mini
- ▶ Indigo 7
- ▶ Aeon Labs Z-Wave USB Stick
- ▶ Amazon Echo Dot
- ▶ LED Smart Bulb
- ▶ Lamp/Outlet Module
- ▶ Aeon Labs Minimote

# WHY AUTOMATE YOUR SMART HOME?

- ▶ Convenience/Luxury
- ▶ Safety
- ▶ Security
- ▶ Energy Efficiency
- ▶ There are many benefits to smart home automation, and lots of different reason why you might decide to make your home smarter.
- ▶ For many people it is a convenience to have lights turn on at night and off in the morning, or to have lights in a closet turn on and off automatically by a motion sensor.
- ▶ Others might choose to automate exactly the same things, but because of safety or security, or because it helps to reduce energy consumption. Because of the varying reasons to automate, you might get some unexpected side benefits.

# CONCERNS

- ▶ Privacy
- ▶ Security
- ▶ Interoperability with other devices
- ▶ Operations
  - ▶ stand-alone operation, with manual controls?
  - ▶ hub device required to operate?
  - ▶ interface for programming and remote control?
  - ▶ web service required?

# WHAT CAN BE AUTOMATED?

- ▶ Schedules (timers)
- ▶ Remote Control
- ▶ Photovoltaic sensor/rain or water sensor/motion detector
- ▶ Interactive (sensor event/trigger-activated)
- ▶ Integrated (monitoring/notifications)
- ▶ Geofencing/presence detection

# TYPES OF DEVICES

- ▶ Outlets (or modules)
- ▶ Lighting (smart bulbs, switches, lamp modules)
- ▶ Home Entertainment (TV, audio)
- ▶ Fan Controls
- ▶ Window Coverings (blinds/curtains/frosted glass film)
- ▶ Thermostats
- ▶ Door Locks/Garage Door Controls
- ▶ Cameras/Security Systems
- ▶ Sprinkler Systems



# VOICE ASSISTANTS

- ▶ Amazon Alexa (Echo devices)
- ▶ Apple Siri
- ▶ Google Assistant
- ▶ Microsoft Cortana
- ▶ Samsung Bixby

# SENSORS

- ▶ Open/Close/Contact
- ▶ Light
- ▶ Motion
- ▶ Temperature
- ▶ Humidity
- ▶ Shock
- ▶ Sound
- ▶ Water

# MAJOR MANUFACTURERS

- ▶ Aeotec/Aeon Labs (Z-wave)
- ▶ Belkin and TP-Link (WiFi)
- ▶ Ecobee (WiFi and HomeKit)
- ▶ GE (Zigbee, Z-wave and Bluetooth LE)
- ▶ Honeywell and Trane (Z-wave)
- ▶ Logitech Harmony
- ▶ Cooper, Leviton and Lutron
- ▶ Nest (BlueTooth, WiFi and Zigbee)
- ▶ Phillips/Signify and Sylvania (Zigbee)
- ▶ Kwikset and Yale (Zigbee)
- ▶ Schlage (Z-Wave and HomeKit)

# PROTOCOLS/STANDARDS

- ▶ X-10 (Power Line Signaling)
- ▶ WiFi (2.4GHz and 5GHz)
- ▶ Bluetooth LE (2.4GHz)
- ▶ Insteon (Newer X-10 compatible mesh network)
- ▶ Zigbee (802.15.4 @ 2.4GHz)
- ▶ Z-Wave (800-900MHz)
- ▶ Apple HomeKit (WiFi and BlueTooth)
- ▶ Thread Group

# GETTING STARTED

- ▶ Pick a platform or protocol
  - ▶ Amazon, Apple, or Google, pick your poison!
- ▶ Leverage existing devices, if any
- ▶ Start small, but think big!
- ▶ Flexibility is good

## STARTER KIT

- ▶ You might consider starting with something like:
- ▶ TP-Link devices are WiFi so no additional hub required
- ▶ Their app and service are free
- ▶ Have a variety of LED light smart bulbs and modules
- ▶ Links with iOS or Android, Google Home or Amazon Echo