

Internet of Things (IoT)

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IoT Definitions

- **Formal Definition per Wikipedia:**

is the inter-networking of physical devices, vehicles (also referred to as "connected devices" and "smart devices"), buildings, and other items—embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data.
- **In Home Automation**

Monitor, control, and automate response to devices (lights, switches, door locks, video, TV, etc.) in your home.

Client / Server Definition

- Client

Program (client) running on a computer that calls a service program (server) running on a computer that returns requested information/data (client & server may be on same computer). The client breaks connection once response received

- Server (also called Service)

Program running on a computer(s) that waits for clients that request information/data or action & response. A computer can run many services at same time. For redundancy and workload balancing, the same service will run on many computers.

- The Cloud

Services running on computers normally outside your home – web services, file services, messaging services, processing services, etc.

My Home Network (for example)



OpenSprinklerPi



Smart TV



Fire Stick



SmartThings Hub



GE Smart LED



Smart DVD Player



Amazon Echo



TP-Link Smart Plug



Nest Smoke / Co2 Detectors (5)

For Experimentation:



Raspberry Pi w/ HABridge software



Multiple ESP8266s
with Sensor /
Activators

Home Automation Products

- Smart TV, Smart DVD/BluRay Player, FireStick
- TV Remote Controllers
- Thermostats
- Smoke Alarms
- OpenSprinklerPi
- Home Automation
 - Hubs
 - Devices
- Voice Response

Smart TVs

- Definition:
 - TV's that support apps to allow viewing of Internet streaming content (free and subscription services), i.e., NetFlix (\$9-13/mo), YouTube (free), Acorn (\$5/mo), ...
- Options:
 - Can pay extra for TV to get “smarts” feature
 - Can pay extra for DVD / BluRay with “smarts”
 - Add on to TV with Amazon FireStick or Roku Stick
- Recommend:
 - Add on stick as TV or DVD “smarts” never updated for new streaming services

DVD / BluRay

- BluRay is popular standard, DVD older
- Recommendations:
 - Do not pay extra for “smart”, add sticks on TV
 - Do you still play DVDs? Many just use streaming services

Remote Controllers

- Harmony Universal Controller (\$50 to 300)
 - Consolidate multiple remote controllers (TV, DVD, Roku, FireStick, etc)
 - Depending on version can also control Philips Hue Lights (Zigbee protocol)

Thermostats

- Smart Thermostats can be much more easily programmed than default thermostat that comes with home
- Recommendation:
 - “Best of Breed” Nest Thermostat about \$200
- Installation:
 - Likely need spare wire to be connected inside furnace

Smoke Alarms

- Default BRK FirstAlert Smoke (\$15) and Smoke+Co2 (\$35) alarms installed in most of our homes
 - Batteries need to be replaced each 6 mos or yearly
 - I have had to replace the combo alarms multiple times in six years
 - Beeps under multiple fault conditions and hard to figure out which alarm of interconnected alarms is causing fault.
 - I believe they are preprogrammed to start beeping in middle of night; never during day when climbing ladder isn't so bad!

Smart Smoke Alarms

- “Best of Breed” Nest Smoke+Co2 Alarms (\$99) are smart Internet enabled alarms
 - Talk to you and tells you:
 - which alarm raised alert
 - what is happening
 - Connects to cloud service for central notification and monitoring. Set up private username & password for your home.
 - Recharger and rechargeable batteries included
 - Installation:
 - Requires work on ladder to replace mounting bracket and minor rewiring (5 minutes per alarm)
 - Max 5 minutes to program (select location name from list, home router name and password, cloud service username and password). Best configured with Tablet or Smart Phone
- Recommendation:
 - What is piece of mind worth?

Smoke Alarm Listeners

- Internet enable devices that listen for smoke alarm and connect to cloud service
 - Cloud service send notification to phone(s) on alarm or when it doesn't hear from listener for some period
- Leo (\$50)

OpenSprinkler

- Replaces provided sprinkler controller in garage (Bird or Hunter)
- OpenSprinkler has Two+ versions
 - OpenSprinkler contains built-in microcontroller
 - OpenSprinklerPi installer adds RaspberryPi (a fully functioning \$35 Linux computer, can be used for other functions)
- Managed via browser on PC, Tablet, Smart Phone
 - 5 minute setup for a complex watering plan
 - Very easy to have different times per zone
 - One click to change watering days
 - Adjusts watering time based on rain gauge, past days and forecasted weather conditions

Home Automation Controllers

- Variously called hubs, bridges, controllers depending on brand – SmartThings, Wink, Wemo, Philips, Insteon
- Support one or more radio communications protocols
 - ZigBee
 - Zwave
 - 433 Mhz
 - WiFi – usually used for setup and connection to cloud service
 - Thread – mesh network used by Nest devices
- Devices to be supported normally only have one radio protocol
- Recommendations:
 - See <https://www.howtogeek.com/303200/smarthings-vs.-wink-vs.-insteon-which-smarthome-hub-should-you-buy/>
 - Choose device types you want to control then select controller
 - SmartThings – good radio coverage, will work locally
 - Wink – excellent radio coverage, requires Internet service (although local operation for switches and lights has been announced there is no documentation)
 - Best configured with Tablet or Smart Phone

Voice Response

- Recommendations:
 - Amazon Echo (best for music playing) or Dot – wide variety of devices supported and growing quickly. Caution when setting up the Amazon voice ordering (either disable or require pin)!
 - Google Home – outstanding voice recognition and response, automation should eventually be good but too early
 - Apple HomeKit uses Siri
 - Best configured with Tablet or Smart Phone

Home Automation Devices

- Smart Lights
- Smart Switches / Dimmers
- Smart Outlets
- Door Locks
- Garage Door

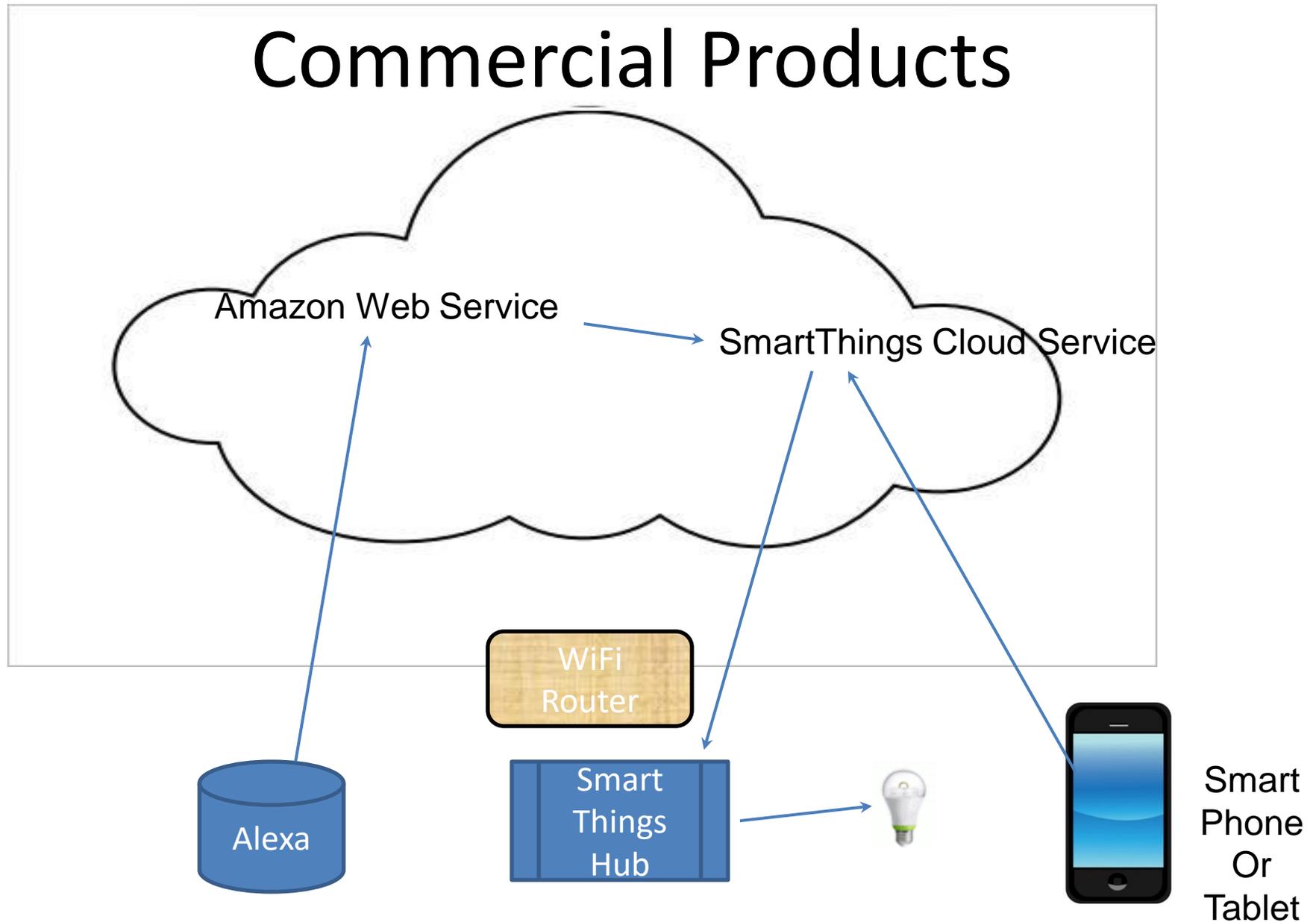
IFTTT

- IFTTT.com (*If This Then That*)
 - Cloud service that allows you to build rules that are triggered by external events, i.e.,

IF my smart phone within 0.5 miles of my house THEN open garage door AND if night time turn on porch light.

IF my smart phone AND my wife's smart phone are not in my house AND movement detected on web camera, THEN send me a text message AND turn on living room light!

The Cloud Is Necessary for Commercial Products



IoT Security

- Home WiFi Router
 - Verify that good userid and password (do not use defaults)
 - Turn off port forwarding (unless really needed)
 - Disable UPnP & NAT-PNP
- Cloud Services
 - Setup good unique passwords
 - Don't use same password for everything (if one is hacked, it cannot be used for others)
- Voice Response
 - Turn off or require pin for Voice Shopping
 - What can someone calling your phone do? Caution about unlocking garage / front doors

Internet of Things SIG

- Meets on 2nd Thursday of each month at 10 AM in Annex
- All welcome to attend
- Usually about experience with commercial products but occasionally about experimentation with self-built microcontrollers and microprocessors
- May 11th topic – introduction to setup and programming Arduino & ESP8266 processors
- June 8th topic – introduction to using Raspberry Pi microcomputers
- See SIG web site within the CA Computer Club site – contains info about areas of interest, products, past presentations, etc
- If you want to be added to IoT SIG mailing list, please email me pete.keefe@gmail.com