Novel Services in Smart Home

eSmart Systems, Halden. 8 March, 2016

About me

Kaniz Fatema Tuly

Master Student in Information Systems

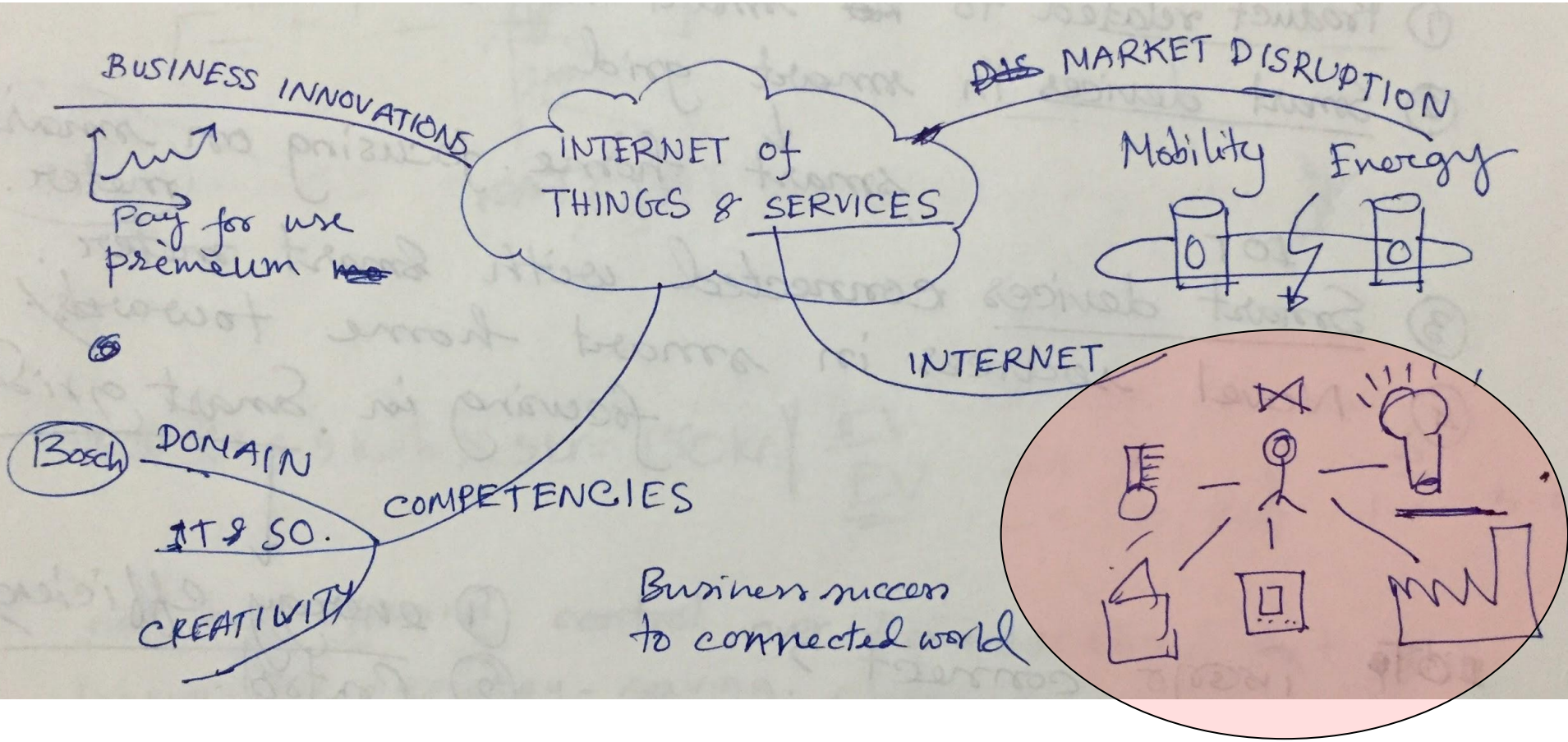
NTNU

Email: kftuly@yahoo.com

- Doing master thesis with iotsec project team
- http://www.iotsec.no/

Smart Home

- Smart home consists of
  - sensors
  - appliances
  - connected together seamlessly mostly without user’s interruption.
  - here, we consider it connected with smart grid
  - Internet of Things and Services
- Novel services - using state of the art technologies in an Internet enabled home
- Here we investigate mainly smart appliances available now
  - Smart grid promotes smart appliances


BUSINESS INNOVATIONS
Pay for use
premium
INTERNET of
THINGS & SERVICES
MARKET DISRUPTION
Mobility
Energy
INTERNET
Bosch
DOMAIN
IT & SO.
CREATIVITY
COMPETENCIES
Business success
to connected world

Smart Appliances

- Home control system with a range of products
  - white goods
- Smart home security systems
- Smart kitchen

Our main focus here is to investigate the selected criteria to compare the novel services in a home automation and focus on smart usage of energy achieving the real benefit by connecting with smart meter and home gateway.

- smart services
- prospective future service
- focused on
  - efficiencies
  - security
  - usability
  - privacy

Smart Appliances - Focused Characteristics

- efficiency
    - how it or its smart features contribute to save energy and cost for its users.
    - related to the implementation of smart grid (smart meter)
- security
    - secure communication?
    - WiFi, Bluetooth, Zigbee or NFC
    - Store data in cloud or in LAN
- privacy
    - communication or control through internet - data passes through manufacturer's server
- usability
    - user’s need to learn? learning curve?
    - unobtrusive?
    - self learning?

Nest Products

- Wi-Fi-enabled thermostats,
- Webcam,
- smoke detectors, and
- other security systems.

- programmable,
- self-learning,
- sensor-driven,

Thermostat :

- Learns user lifestyle, season
- Adapt temperature
- Compatible with most HVAC systems
- Conglomerate with other devices such as whirlpool washing machine
- Devices are interconnected with each other using protocol Weave (which is based on IEEE 802.15.4 and Wi-Fi 802.11 b/g/n) .
- Supports openHAB - to be incorporated with other home automation devices.
- Efficiency
    - save an average 20% energy consumption - turn itself down to save energy when user is away
- Usability
    - Touch sensitive display.
    - Learn when to shut down and switch on
    - Remotely controllable by smartphone and web interface.
- Privacy : The communication is done through Nest as well as data are routed through them. Automatic adaption may cause infringement of privacy.

Nest Cam

- Works with Nest thermostat.
- Switch on itself.
- With 24/7 live streaming
- looks for motion and sends an alert to your phone if it sees something.
- advanced Night Vision,
- Activity alerts, one app for all your Nest products
- Advanced algorithms in the cloud using depth sensing and face detection

Whirlpool 6th Sense Live

Whirlpool produces a smart appliances with ‘6th Sense Live Technology’.

- smart washing machine
- interactive kitchen

This machine reduces energy usage, optimize and track energy by connecting to the smart grid.

Whirlpool 6th Sense Live - washing machine

- Smart energy features
  - Energy Advisor, Rate Revealer and Smart Delay
- Smart stat (Product information)
  - start date, days online and cycle progress, history
- Work with Nest learning Thermostat - home/away mode
- Security: uses WiFi, register to the vendor’s system.
- Usability: Smartphone app
  - detergent dispenser, send notifications, touch control, voice command

Interactive kitchen

Interactive kitchen have options to

- Warming coffee cup, infant milk bottle at desired temperature
- Suggest lunch menu
- Using Amazon dach replenishment.

Belkin WeMo

WeMo is a family of simple, ingenious products that make life easier, simpler and better.

- ➔ WEMO Insight Switch- turn plugged in devices on/off. controlled via IP network.
- ➔ light sensor,
- ➔ Smart Heater , auto frost protect feature
- ➔ slow cooker,
- ➔ coffee maker,
- ➔ room heater,
- ➔ video camera etc

Belkin

Services:

- Remote Scheduling
- send notification
- Control via IP network,
    - risk for malicious attack. Had security flaws earlier in its UPnP implementation that allows an unauthorized user to take control of the switch.

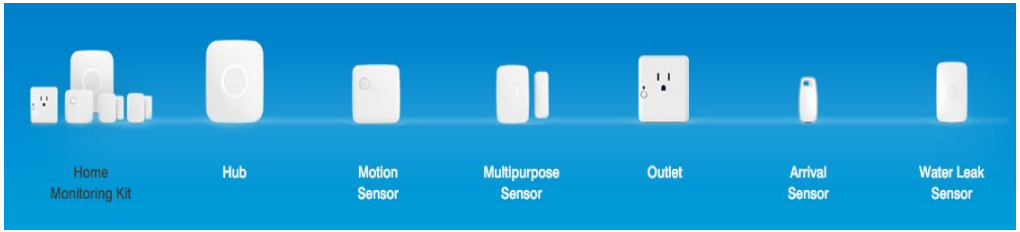
Support:

- IFTTT Technology
- openHAB

Philips Hue Product

- Personal wireless lighting product
- 3 bulbs support full spectrum of color
- uses WiFi
- control with Mobile App, remotely through Hue Bridge
- Possible to control
  - multiple bulbs, multiple lighting systems
  - changing color set by mood, image saved from phone
- Light can sync with music.
- Technology:
  - Geo-fencing Technology (lights can be on and off)
  - open ZigBee Light Link standard (integrate with if it has)
  - Supports Apple’s homeKit

SmartThing from Samsung

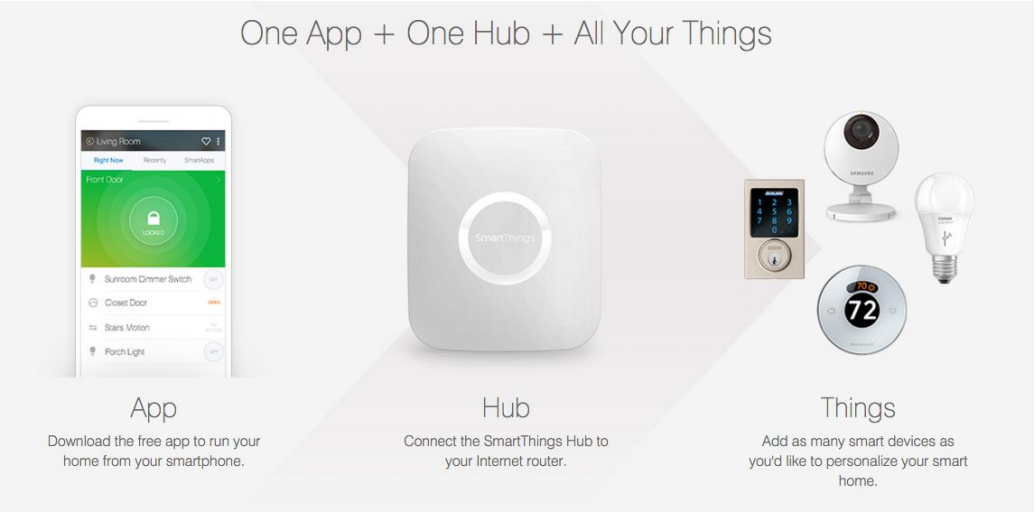


- Smart hub to control smart devices.
- an open platform for smart homes and the consumer of Internet of Thing
- equipped with Wi-Fi and Bluetooth connectivity
- it obtains its objectives through the uses
    - hub - "gateway" or "home controller",
    - cloud platform, and
    - client applications.

SmartThing from Samsung

- works with many third-party IoT appliances
  - From Netgear, Philips, Honeywell and August.
- can integrate the products to form a connected house with products from partners like
  - Philips Hue, Belkin WeMo etc.
- With SmartThings app it is possible to control all smart devices in a smart home.
- connects directly to a home's internet router
  - compatible with communication protocols such as ZigBee, Z-Wave, and IP-accessible devices.
- SmartThings Shop

SmartThing



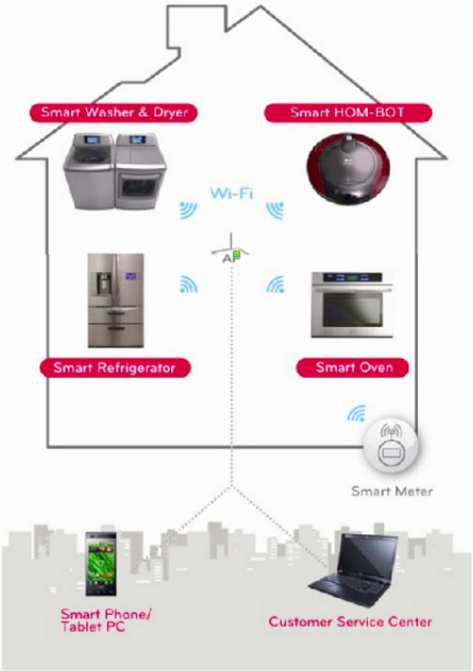
- SmartThings Arrival sensor
- SmartThings Water Leak Sensor
- Connected camera
  - video recording for unexpected
  - entity, motion or sound detected when user is unaware.
- Alarm - flashing siren, multi purpose sensors or motion sensors.
- Thermostat
- Smart Lock - lock/unlock from anywhere
- Power Outlet - control from anywhere, iron plug switch off.
- Possible to set up different notification as per importance.

LG Smart ThinQ

- series of smart appliances
  - interoperate among themselves using LG HomeChat hub.
- HomeChat hub is also compatible with other devices including the Nest Thermostat.
  - LG call communications between hub and the devices a ‘chat’ as it sends message through app which can control devices remotely
- turning on washer, updating washing cycles, checking refrigerator's inventory and commanding robot vacuum to clean living room carpet
- able to diagnose issues with compatible products such as LG Smart ThinQ ovens and fridges.
- Apps show energy usage

LG Smart ThinQ

- Features Smart Grid,
- Access
  - control and monitor appliances from outside
- Refg. count no. of door opening
- Display shows each appliance's energy consumption.
- SmartThinQ Sensor -
  - designed to work with traditional low-tech devices to make smart aware.



Honeywell Tuxedo Touch

- Honeywell has a broad range of home security and automation products.
- It provides seamlessly integrated security with
  - voice commands - Wakeup, BedTime,Returning home, Evening, Leaving the house, Cameras in voice list.
  - video viewing and recording
  - control Z-Wave enabled thermostats
- Total Connect Remote service -
  - Control Tuxedo Touch
  - Receive important alerts
  - Live video on up to six camera at a time to keep an eye on family members. record two minutes video clips on a SD card for visual verification of an alarm event or system activity.

Honeywell Tuxedo Touch (cont...)

- Environmental Sensor - detects floods, leaks, extreme temp.
  - Honeywell state-of -art sensor is capable to sense movement by listening sound and send alert to phone.

- Wireless theft protection sensors- can be affixed to any valuable things, that send alert when attempt to move or disturb the object.
- Panic pendants-
  - provide secure feeling by summoning emergency help
  - send signal to central station to call emergency
- The door locks can be unlocked from office -
  - can auto turn on/off with arm and disarming security system
  - Scene and schedules for adder safety and convenience.
  - Lock supports programming scene and scheduling and remote control.

Honeywell Tuxedo Touch (cont...)

- outdoor lights automatically turn on at sunset and off at sunrise
- Touchscreen hub can organize video monitoring , smart lock, heating and so on. Just need voice command to activate home monitoring.
- Built in web server
  - allows for local control of the system through any WiFi enabled device
  - Remotely lock and unlock doors, schedule lock system, arm, disarm or check the security system.
- Security
  - can be monitored by central systems if user want. They have highly trained home security professionals always stand by, ready to send help.

Aros Smart Air Conditioner

- smart air-conditioning system
  - learns from your budget, location, schedule, and
  - usage to automatically maintain the perfect temperature and
  - maximize savings for your home.
- uses smart phone's GPS to turn off when user leave and set perfect temperature at home when user come back home.
- Except the mobile app it is not compatible with any kind of smart home gateway's standard protocols.

Sensibo

- a small device that turns any air conditioner into an smart air conditioner
- The compatible air conditioners must have a remote controller.
  - Uses IR commands
- as well as reduces its energy consumption.
- Connect Internet through WiFi.
- Set timer
- pre heat
- adapting with lifestyle
- supports IFTTT, Amazon Echo, SmartThings, OpenHAB and Apple HomeKit

SkylinkNet Home Security System

- smarter' home security system
- window and door fixtures contain motion sensors
- alert you when there is a trigger through an accompanying application.
- easy to set up and connect with the smartphone,
- comes with a keychain hob which allows users to remotely alarm and disarm a system
- 'panic' button, which if pressed, alerts the connected smartphone to the call for help.
- Skylink HomeControl Receiver
    - home automation is possible in terms of lights and appliances switching on and off,

Kevo

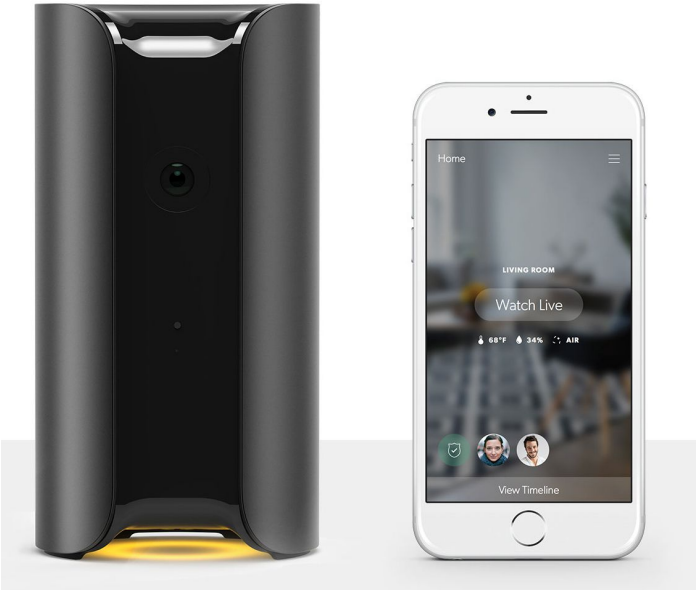
- Kevo (Key Evolved) from Kwikset
- electronic deadbolt which communicates with a Kevo Fob and accompanying smartphone app to lock and unlock a door.
- Interoperate with Nest
- temporary eKeys can be given to friend to open the door

Skybell

- SkyBell is a smart video doorbell
- Skybell also works with Nest

Canary

- security system into a sleek box
- Two way audio
- Home health technology
  - monitors air quality,
  - temperature, and
  - humidity.



SwannOne

- comprehensive security system
- single platform
- uses the latest wireless technology such as Wi-Fi, ZigBee and Z-Wave
- integrate with other leading smart home brands and devices, such as
  - Philips Hue, GE Jasco and WeMo lighting;
  - nest thermostat;
  - Kwikset, Weiser, Yale, Assa Abloy and Lockwood locks;
  - Samsung SmartThings and CentraLite Smart plugs; and
  - Chamberlain Garage Door Openers.

Service Standards

Smart appliances use wireless technology such as, bluetooth, zigbee, Z-wave, RF, IR or WiFi.

Service standards:

- openHAB
- IFTTT
- Apple HomeKit
- Amazon Dash Replenishment Service

openHAB

A software for integrating different home automation systems and technologies into one single solutions

- open Home Automation Bus
- automation rules
- uniform user interfaces and web-based UI
- Bindings (scripts) are optional packages that can be used to extend functionality of openHAB.
- can run on any device that is capable of running a JVM
- is easily extensible to integrate with new systems and devices

IFTTT (IF This Then That)

A free web-based service that allows users to create chains of simple conditional statements.

- ‘recipes’ - conditional statements
- triggered based on changes to other web services such as Gmail, Facebook, Instagram, Pinterest etc.
- ‘channels’ - connect the external services that triggers an ‘action’.
- Producer must provide compatible IFTTT channel.
  - Nest thermostat
  - Philips Hue

- *if the user is tagged by someone on Facebook, then that photo will be added to the user's cloud-based (e.g. Dropbox) photo archive.*
- *“When your Nest is set to away, your lights will turn off”*

Apple HomeKit

- home automation API from Apple
- Discover accessories and add to the HomeKit Collection. Have you purchased a smart plug or lamp, you can add that to your collection.
- Hardware manufacturer must have MFi license from Apple
- home automation can be controlled easily without each of them having their own app.
- communication - IP, bluetooth, bonjour
- only for iOS devices - iPhone/iPad/iPod

Amazon Dash

Amazon Dash Replenishment Service (DRS) enables connected devices to order physical goods from Amazon when supplies are running low

- *washing machine detergent dispenser orders more detergent when it is going to be empty.*
- Leverages
  - Amazon's authentication and payment systems,
  - customer service, and
  - fulfillment network—giving their customers access to Amazon's low prices, great selection, and reliable delivery
- Two ways to connect
  - physical button or
  - can measure consumable usage so that reordering happens automatically.

References

(Amazon Dash, 2016). https://www.amazon.com/oc/dash-replenishment-service. Retrieved on February, 2016.
(Belkin, 2016). http://www.belkin.com/us/Products/home-automation/c/wemo-home-automation/. Retrieved on January, 2016.
(Farhangi, 2010). H. Farhangi. The path of the smart grid. IEEE Power & Energy Mag., 8(1):18–28, 2010.
(Etsi, 2016). http://www.etsi.org/technologies-clusters/technologies/smart-appliances. Retrieved on January, 2016.
(Honeywell, 2016). Available at http://homesecurity.honeywell.com/tuxedo_touch.html. Retrieved on February, 2016.
(HomeKit, 2016). Available at https://developer.apple.com/homekit/. Retrieved on March, 2016.
(IFTTT, 2016). Available at https://ifttt.com/recipes. Retrieved on February, 2016.
(Kevo, 2016). Avaialble at http://www.kwikset.com/kevo/. Retrieved on February, 2016.
(Nestlabs, 2016). Available at https://en.wikipedia.org/wiki/Nest_Labs. Retrieved on January, 2016.
(NestCam). Available at https://nest.com/camera/. Retrieved on February, 2016.
(NestWeb, 2016). Available at https://nest.com/thermostat/meet-nest-thermostat/. Retrieved on January, 2016.
(openHAB 2016). http://www.openhab.org/. Retrieved on on January, 2016.
(Sensibo, 2016). Available at https://sensibo.com/. Retrieved on February, 2016.
(SkyBell, 2016). Available at http://www.skybell.com/. Retrieved on February 2016.
(SmartThings, 2016). https://www.smartthings.com/. Retrieved February, 2016.
(Whirlpool Web, 2016). http://www.whirlpool.com/-[WFL98HEBU]-1021442/WFL98HEBU/. Retrieved on January, 2016.
(Zdnet, 2016). http://www.zdnet.com/pictures/top-10-smart-home-gadgets-and-appliances/. Retrieved on February, 2016.

Questions ?