

# Build an IoT Smart Home System

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**Date & time:** Saturday, 14<sup>th</sup> December, 11:00am - 2:00pm



تركيب  
**THE ASSEMBLY**  
MAKE | SMART | THINGS





# ABOUT THE ASSEMBLY

- A **Smart Lab** based out of **in5** since December 2014
- Over 250 Free workshops done
- **Assembly : HACK** - Embedded systems, IOT, hardware.
- **Assembly : CODE** - Software projects - APIs, frameworks, apps
- **Assembly: Data Science** - Advanced topics related to AI/Machine Learning
- Target Audience – **Students | Professionals | Entrepreneurs**
- Focus on Smart Technology and Practical Applications
- Forum: [members.theassembly.ae](https://members.theassembly.ae)



# ABOUT THE ASSEMBLY

**FACEBOOK** The Assembly - @MakeSmartThings

**TWITTER** @MakeSmartThings

**INSTAGRAM** @MakeSmartThings

**YOUTUBE** The Assembly



# OVERVIEW

OBJECTIVE: To build a distributed **IoT smart home system**, that:

- Checks the status of home devices such as locks, lights and cameras on various edge devices (ie; **Raspberry Pis**)
- Syncs up that data with **the Thingworx cloud platform** in real time
- Allows for remote control of these devices
- Presents data and encapsulates functionality in the form of a web application accessible at a remote location



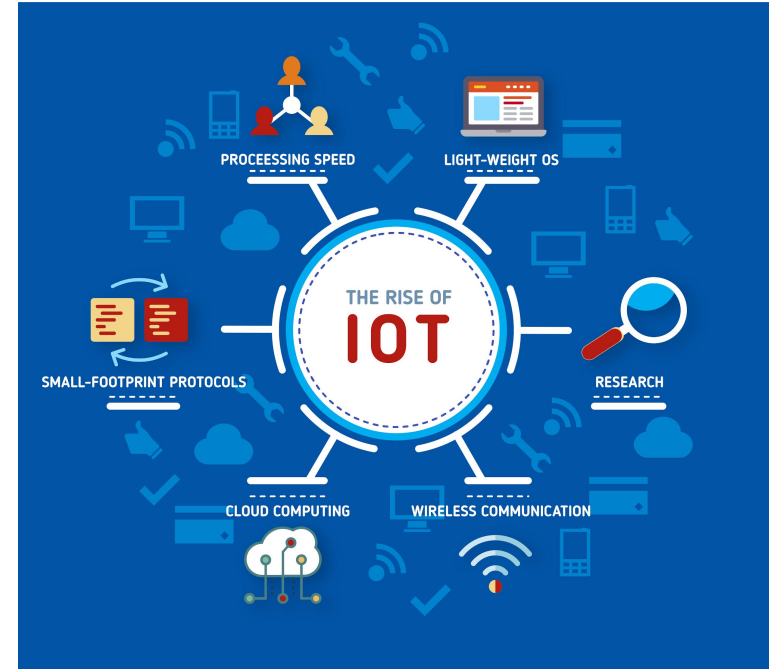
# GITHUB

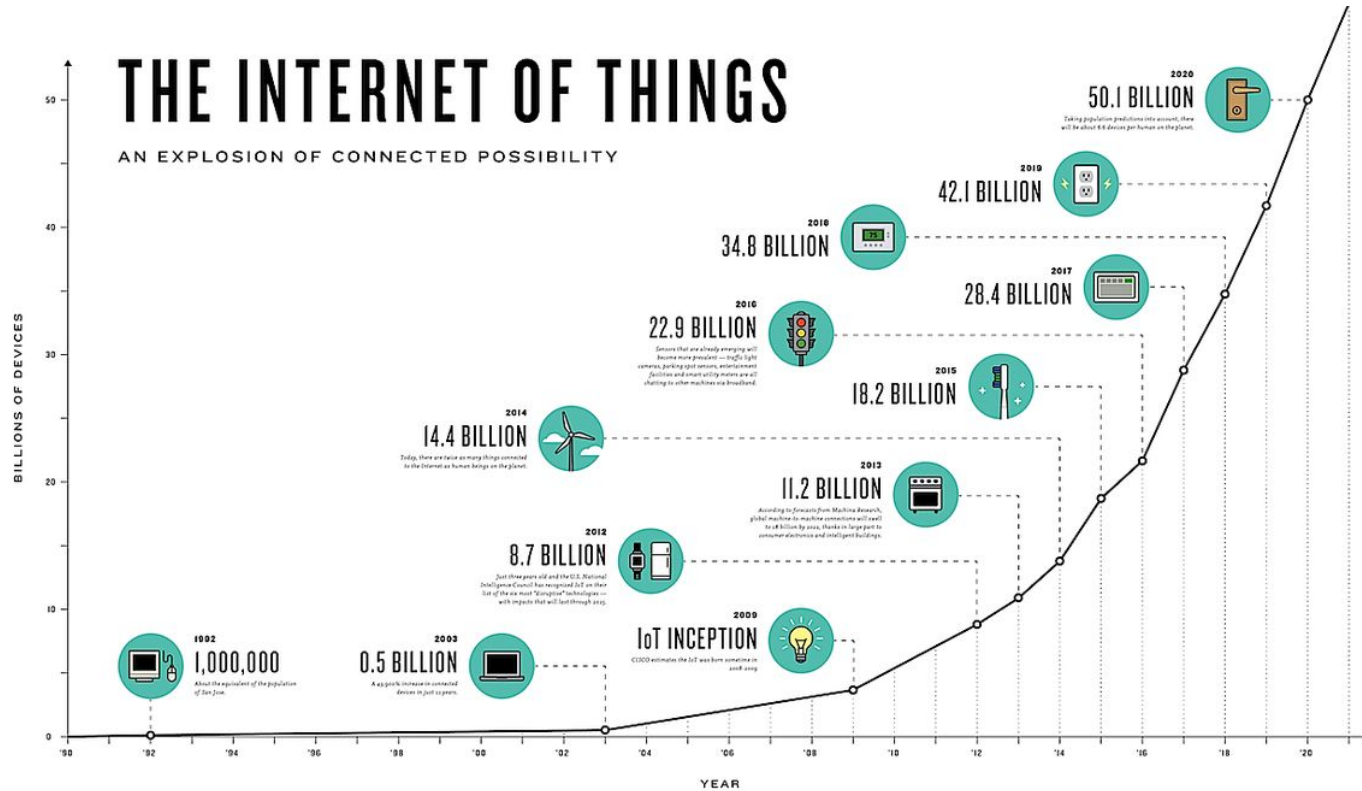
- PASTEBIN: <https://pastebin.com/ZzY42Ejv>
- GITHUB:  
<https://github.com/The-Assembly/IoTSmartHome-With-Thingworx>



# THE INTERNET OF THINGS

- The Internet Of Things (IoT) is the **network of physical objects that can exchange data for value**

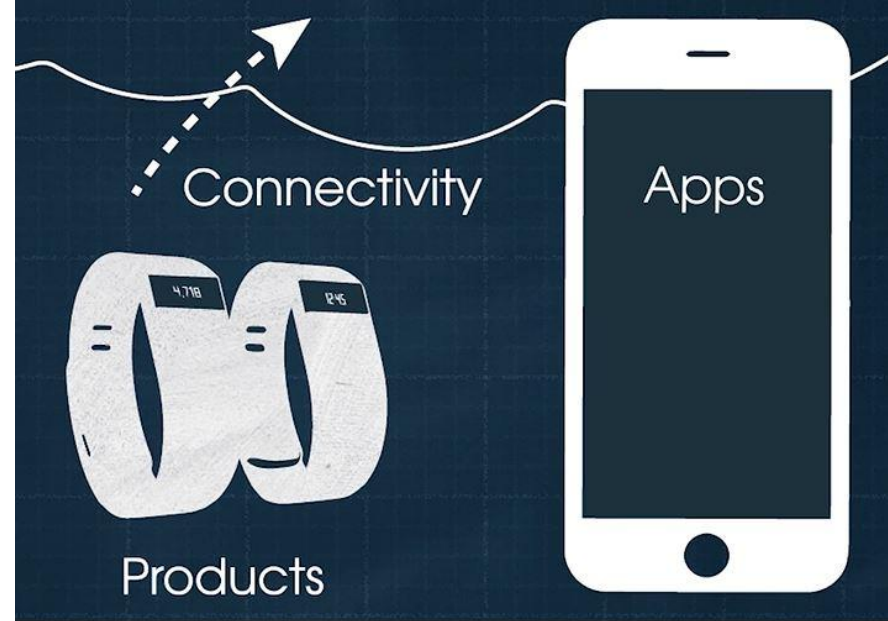






# SMART, CONNECTED PRODUCTS

- [Harvard Business Review](#)
- Capabilities of a **Smart, Connected Product (SCP)**
  - Monitor
  - Control
  - Optimize
  - Automate





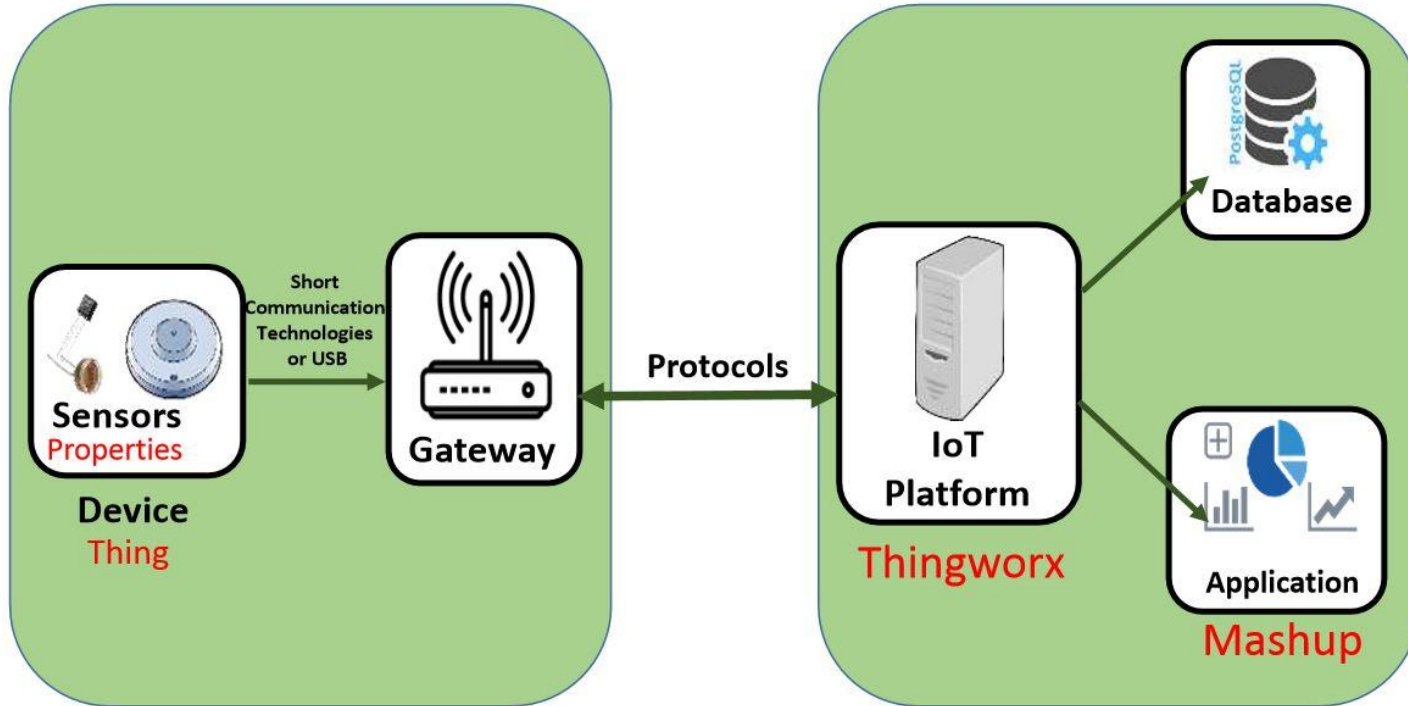


# THINGWORX FEATURES

- Fast To Market
- Simplicity
- Scalability
- Built-in Analytics
- Multi-tenancy model
- Data Encryption

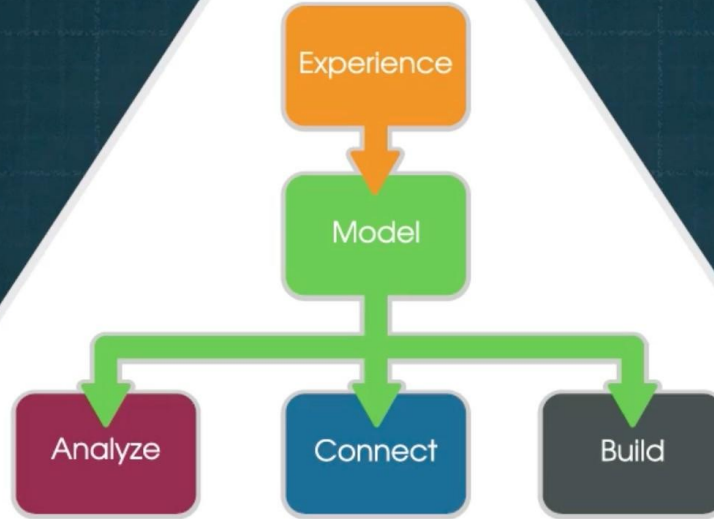


# THINGWORX GENERAL STRUCTURE



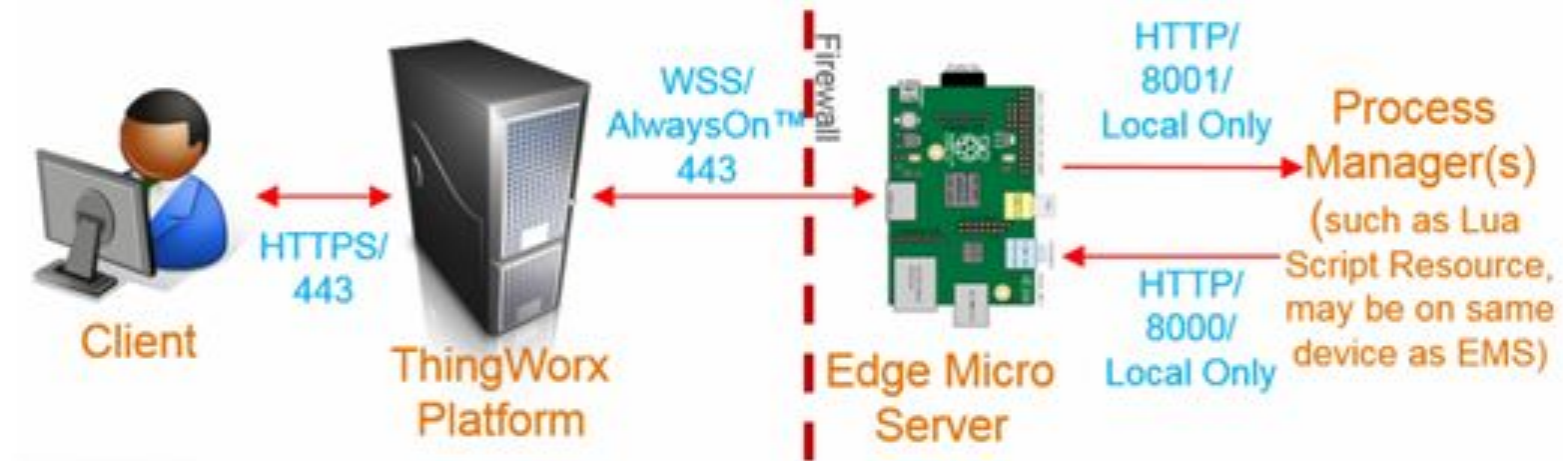


# THINGWORX DEVELOPMENT PROCESS





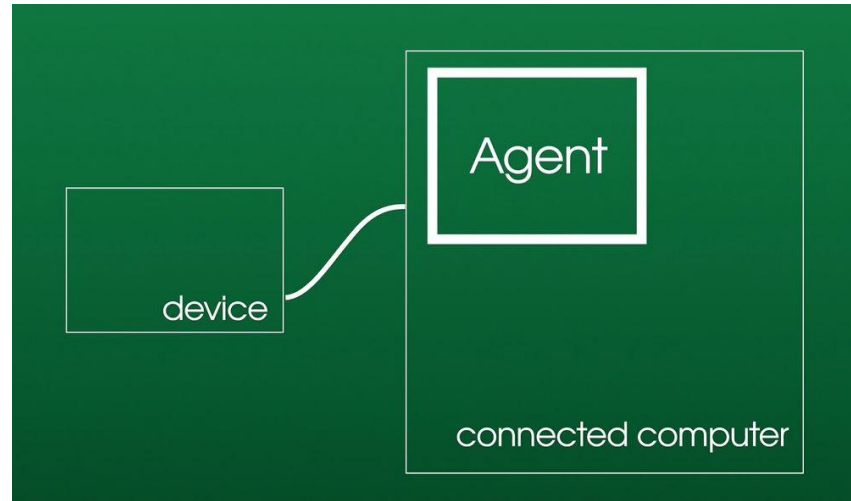
# CONNECTIVITY





# EDGE AGENTS

- Software to monitor data from / control device(s)
- Can be used to:
  - Change configs
  - Update firmware
  - Optimize procedures
- **Keeware**
- Edge SDKs (C, Java, JS)





# WEB SOCKETS

APPLICATION

TRANSPORT

INTERNET

LINK





# EDGE MICROSERVER (EMS)

- Out of the box edge agent with **Thingworx**
- **EMS can:**
  - Bind remote things on cloud to virtual things on edge
  - Maintain AlwaysOn connection with cloud
  - Allow device to call cloud REST API in LAN
  - Enable **File Transfer & Tunneling**



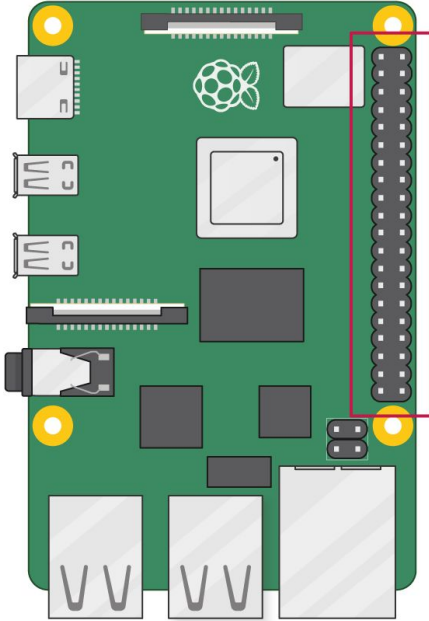
# LUA SCRIPT RESOURCE

- EMS cannot manage remote properties, events or services
- LUA Script Resource acts as a process manager to do this
- Can be on same machine as EMS





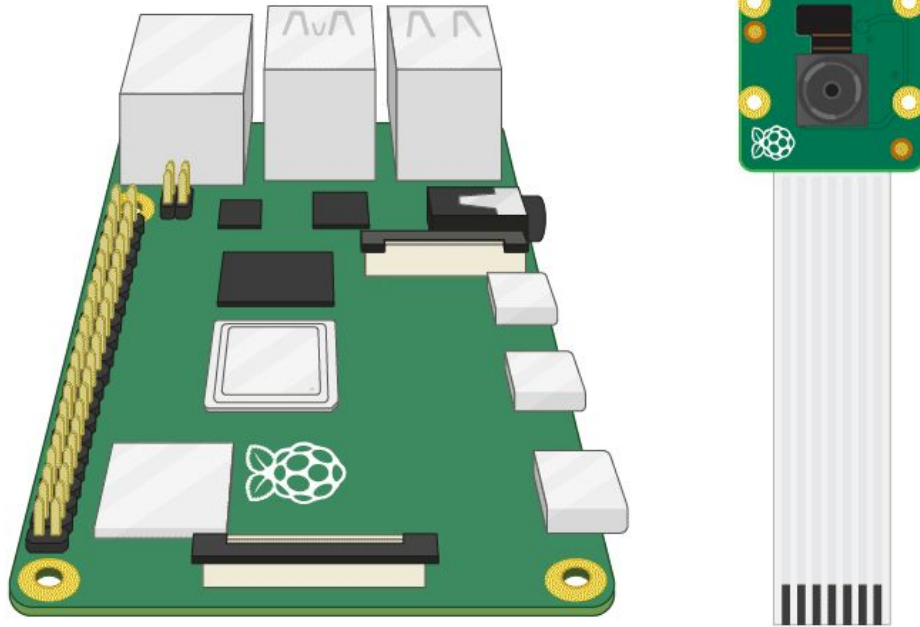
# RASPBERRY PI PINOUT



3V3 power	1	2	5V power
GPIO 2 (SDA)	3	4	5V power
GPIO 3 (SCL)	5	6	Ground
GPIO 4 (GPCLK0)	7	8	GPIO 14 (TXD)
Ground	9	10	GPIO 15 (RXD)
GPIO 17	11	12	GPIO 18 (PCM_CLK)
GPIO 27	13	14	Ground
GPIO 22	15	16	GPIO 23
3V3 power	17	18	GPIO 24
GPIO 10 (MOSI)	19	20	Ground
GPIO 9 (MISO)	21	22	GPIO 25
GPIO 11 (SCLK)	23	24	GPIO 8 (CE0)
Ground	25	26	GPIO 7 (CE1)
GPIO 0 (ID_SD)	27	28	GPIO 1 (ID_SC)
GPIO 5	29	30	Ground
GPIO 6	31	32	GPIO 12 (PWM0)
GPIO 13 (PWM1)	33	34	Ground
GPIO 19 (PCM_FS)	35	36	GPIO 16
GPIO 26	37	38	GPIO 20 (PCM_DIN)
Ground	39	40	GPIO 21 (PCM_DOUT)



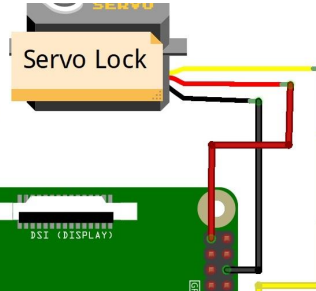
# CONNECTING THE PI CAMERA



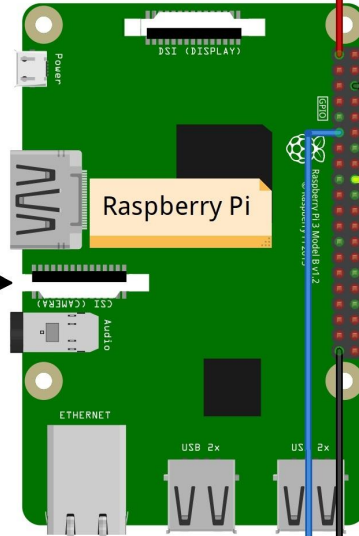


# CIRCUIT DIAGRAM

Brown Wire -> Pin 6 (GND)  
Orange Wire -> Pin 1 (3.3 V)  
Yellow Wire -> Pin 18 (PWM)



Connect  
Camera  
Here



Raspberry Pi

LED

LED -> Raspberry Pi  
Shorter end -> Pin 39 (GND)  
Longer end -> Pin 11 (GPIO)