



The internet of things

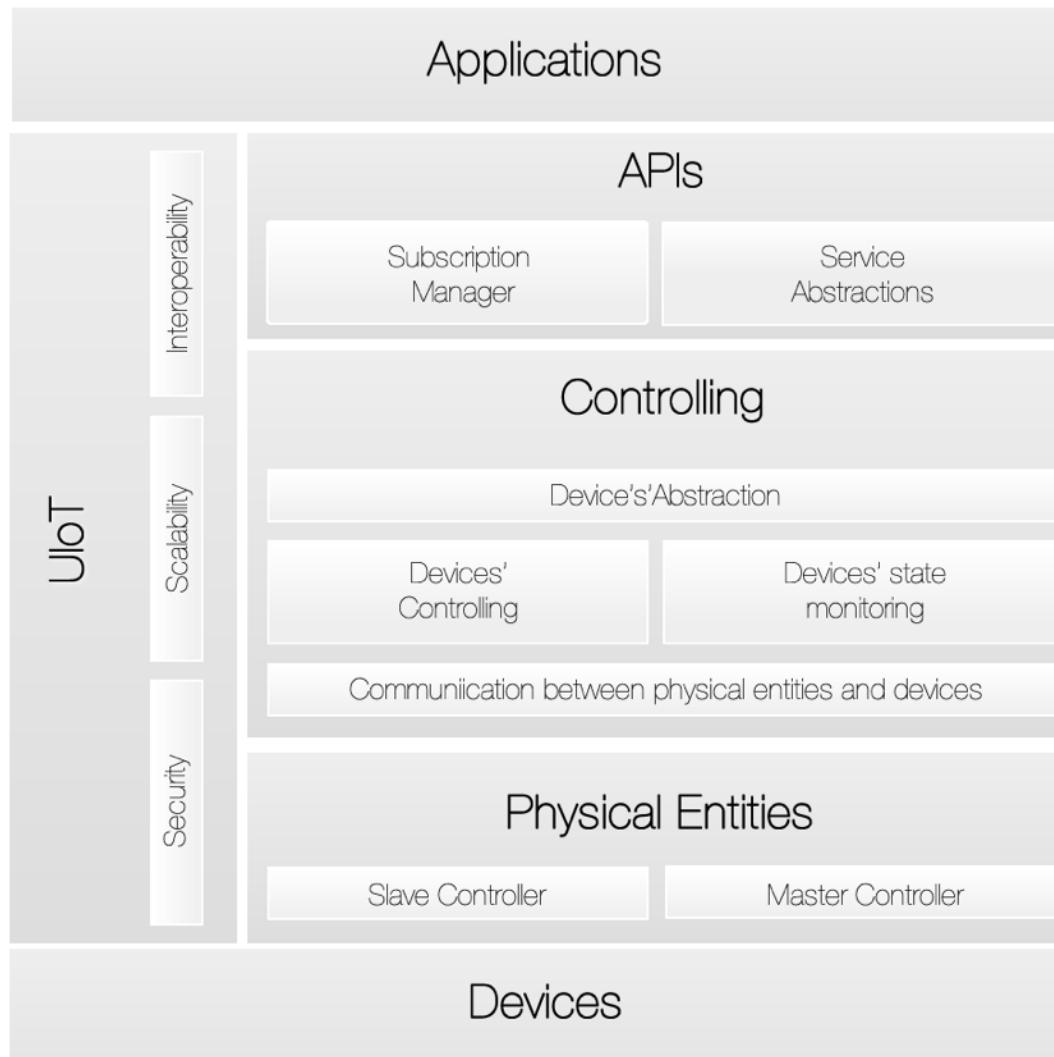
An overview

M.Eng. Hiro Ferreira



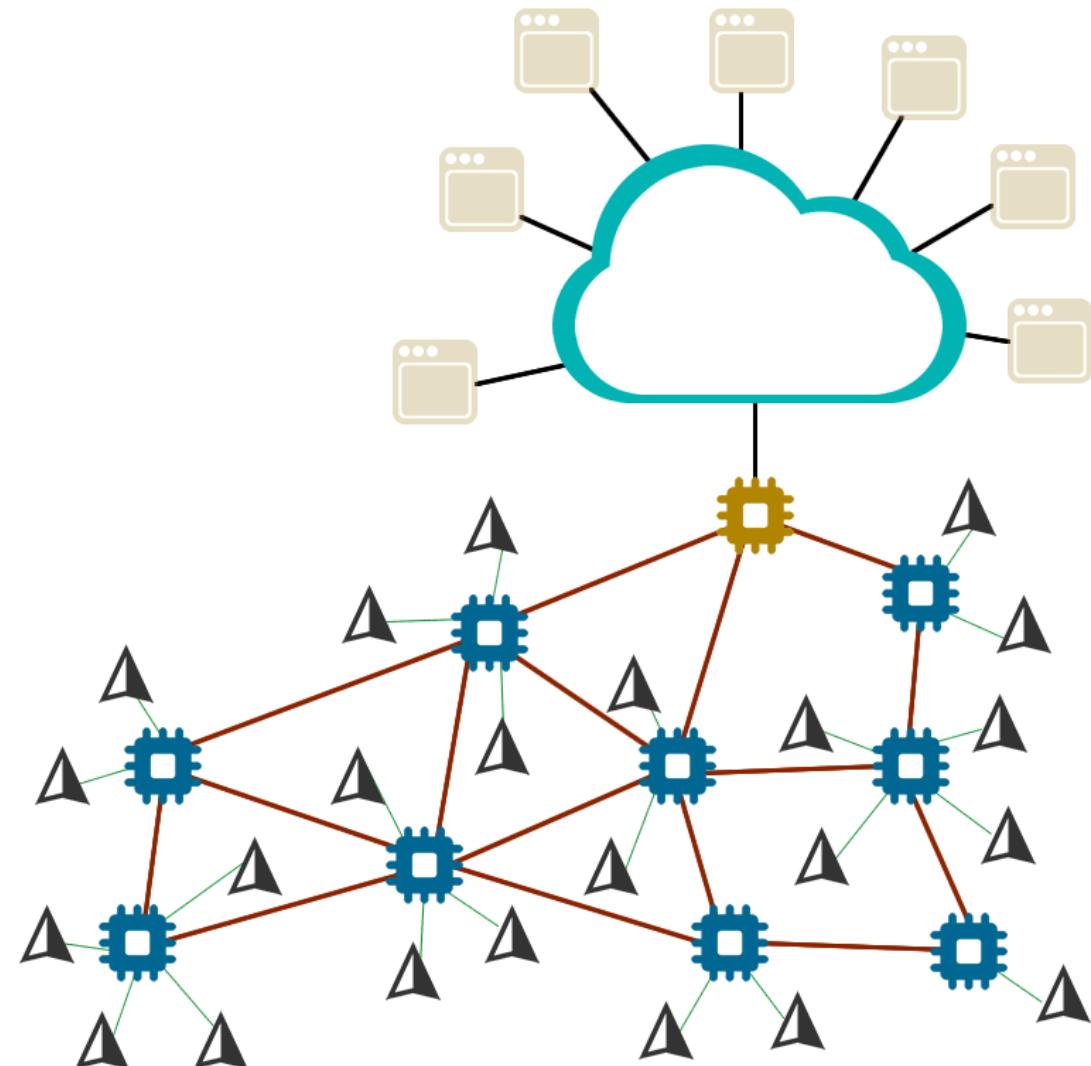
Architectures - UIoT

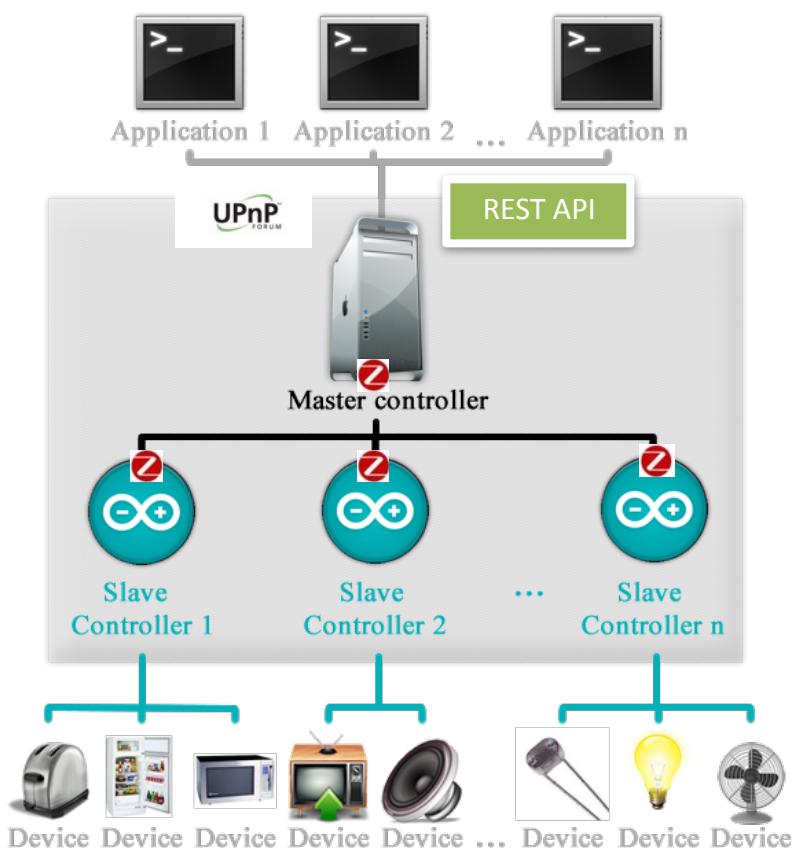
LabRedes



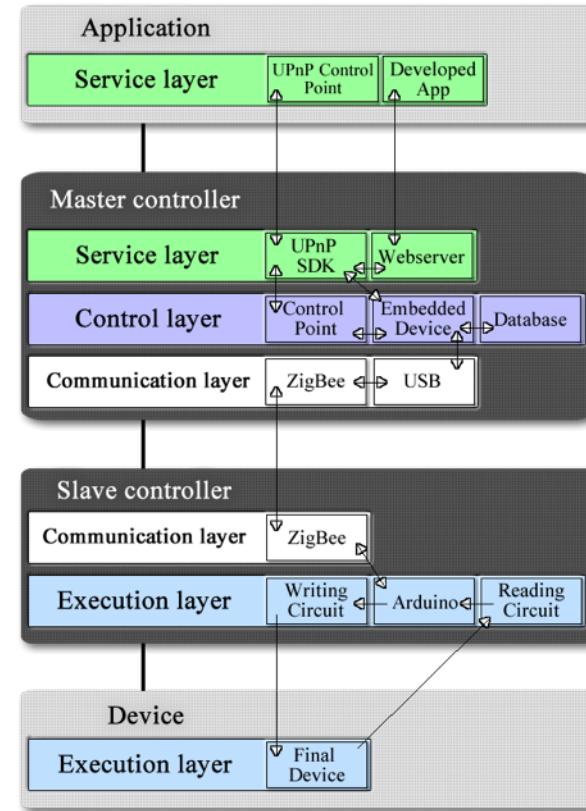


Caption	
—	TCP/IP Link
—	ZigBee Link
—	Digital or Analog Serial Port
	Master Controller
	Slave Controller
	WAN, MAN or LAN
	Object/Device
	Application/Entity



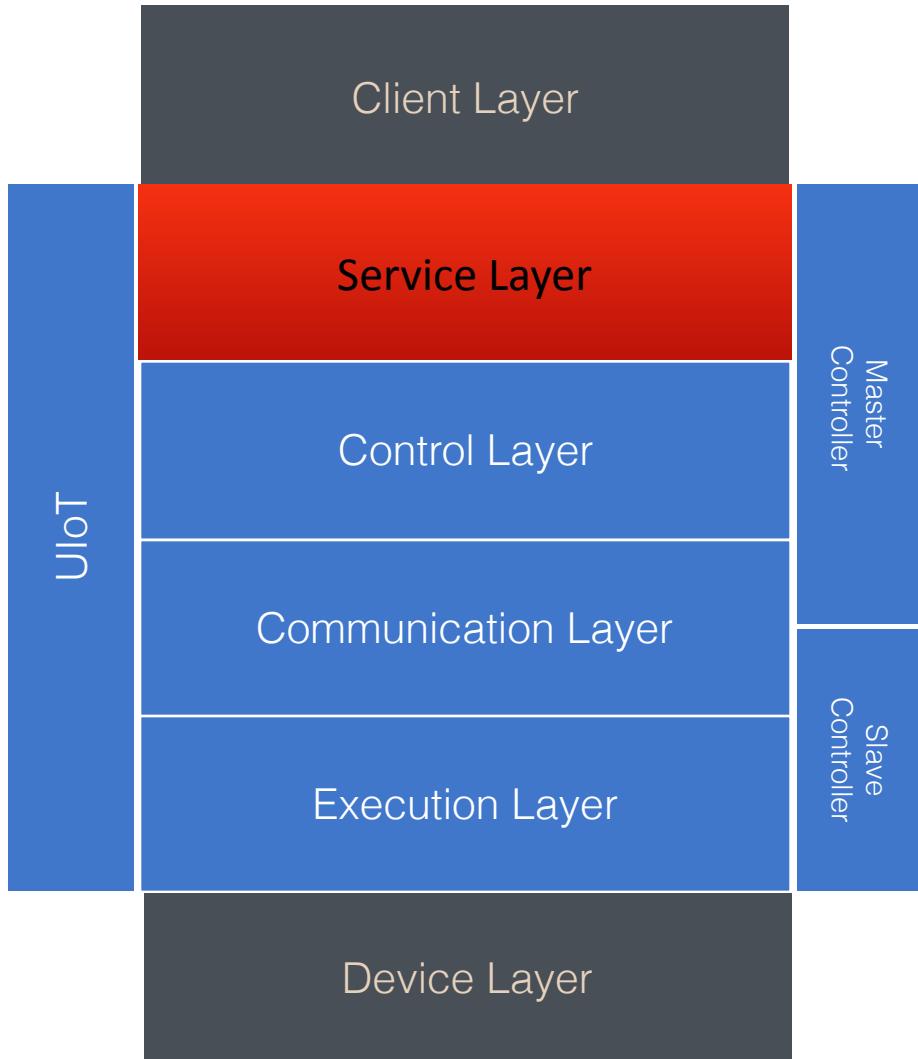


Physical architecture



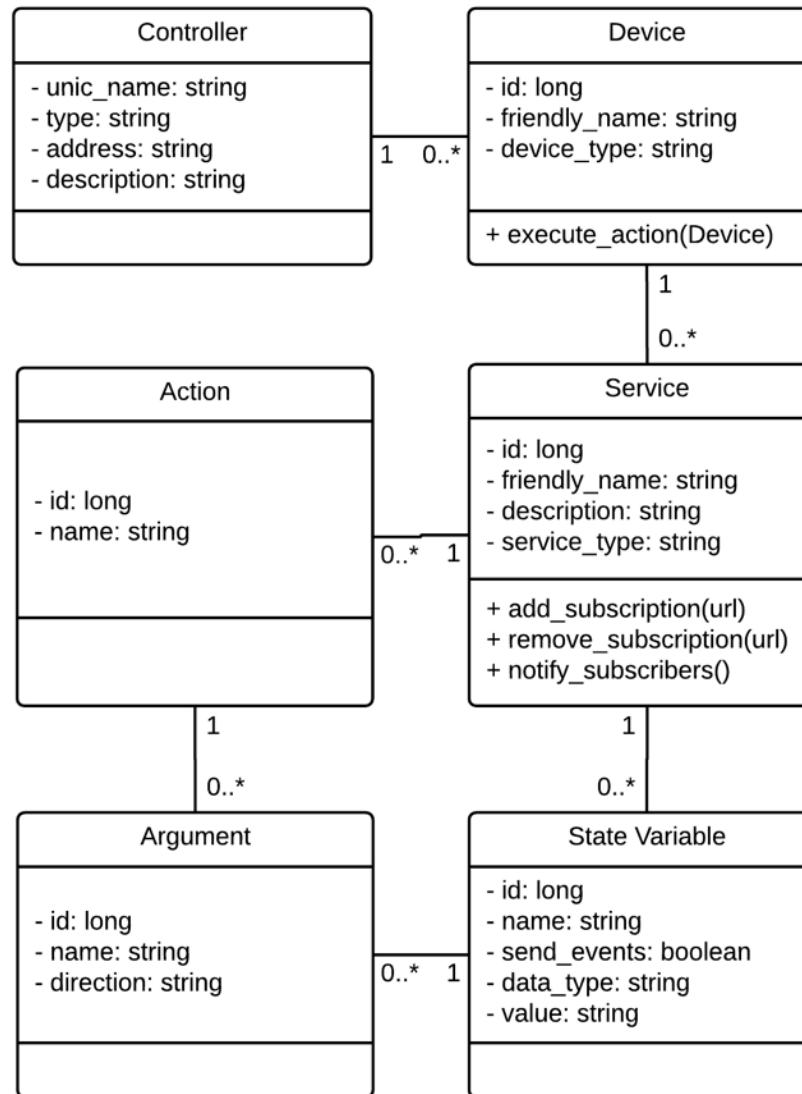
Layered architecture

Solution Layers





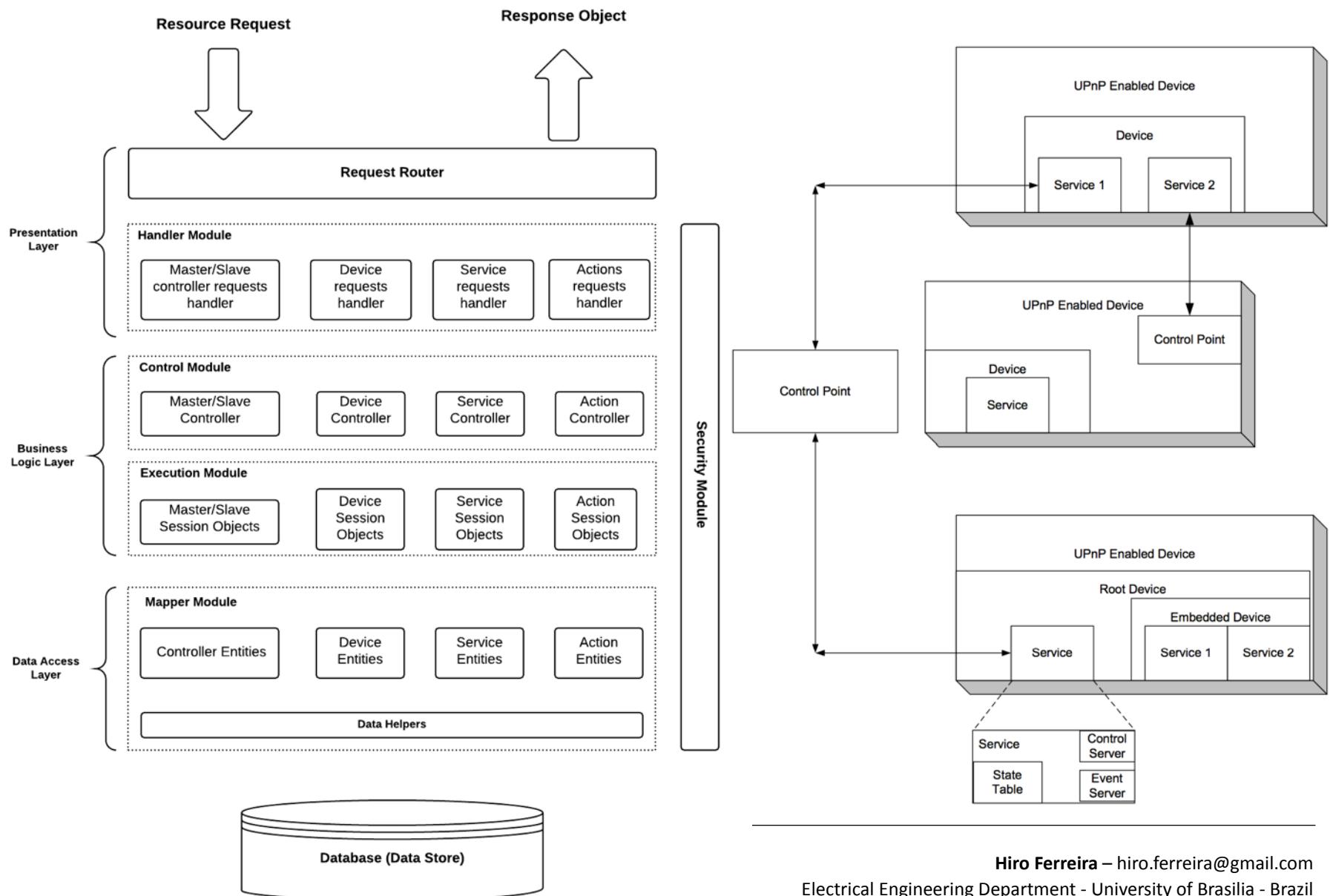
Architectures - UIoT



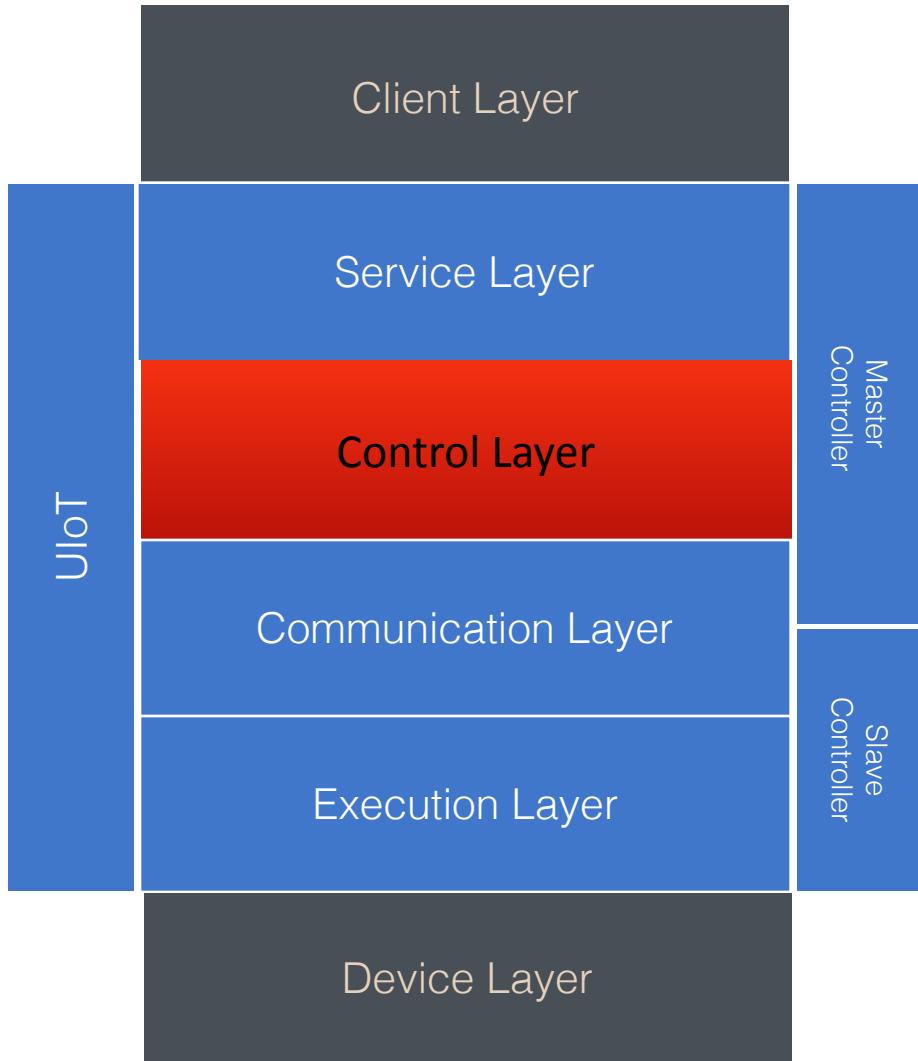


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LabRedes

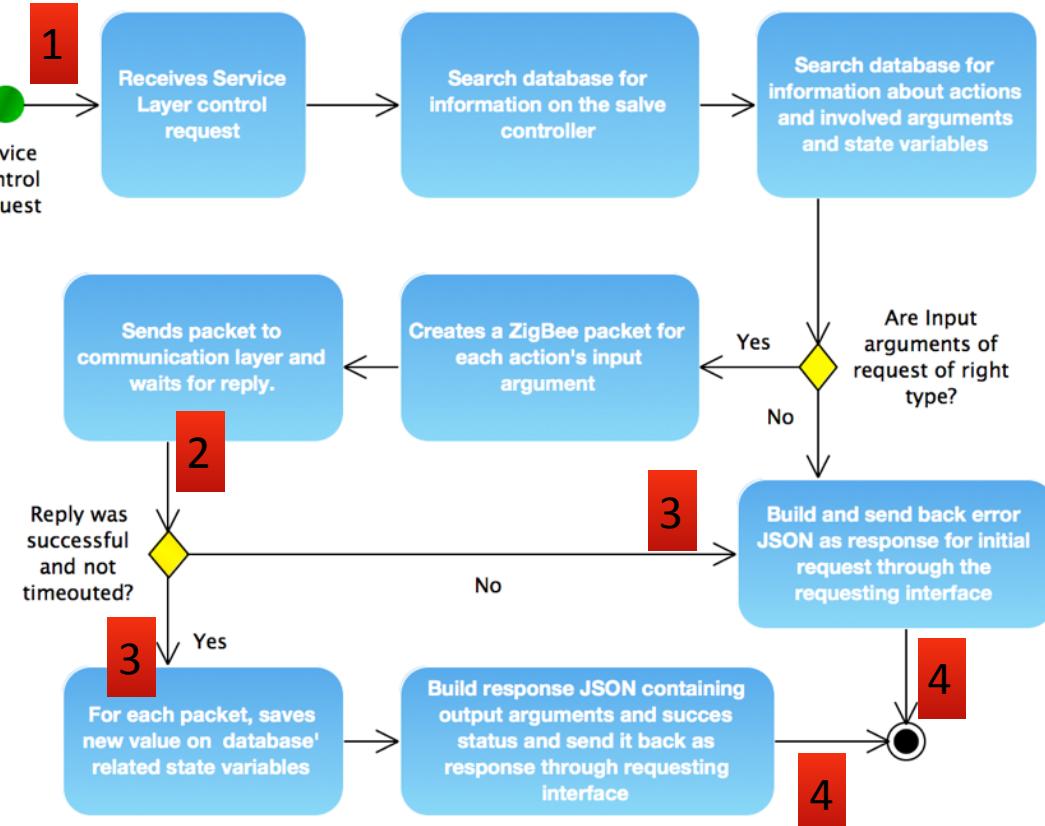


Solution Layers





Architectures - UIoT



{

```
device: device_id,  
service: service_id,  
action: "action name",  
input_arguments:{  
    argument_1_name: argument_1_value,  
    //...  
    argument_n_name: argument_n_value  
}  
}
```

{

```
zigbee_address: target_slave_address,  
pin: pin_number,  
operation_mode: "operation mode",  
baudrate: rate ,  
data_type: "type",  
data: data
```

}

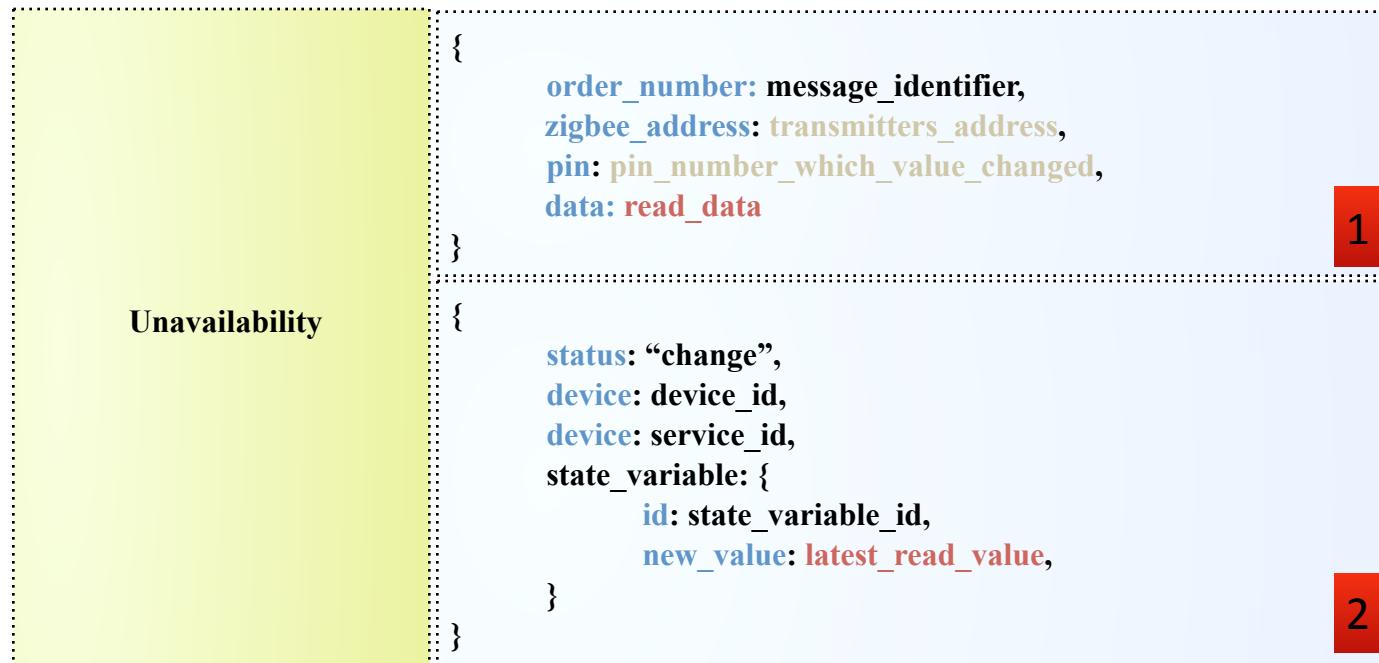
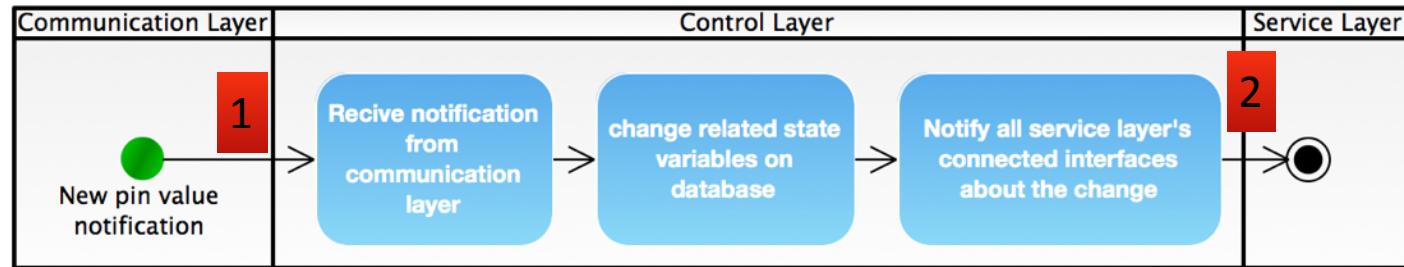
{

```
status_code: "CODE",  
status_message: "message",  
output_arguments:{  
    argument_1_name: argument_1_value,  
    //...  
    argument_n_name: argument_n_value  
}
```

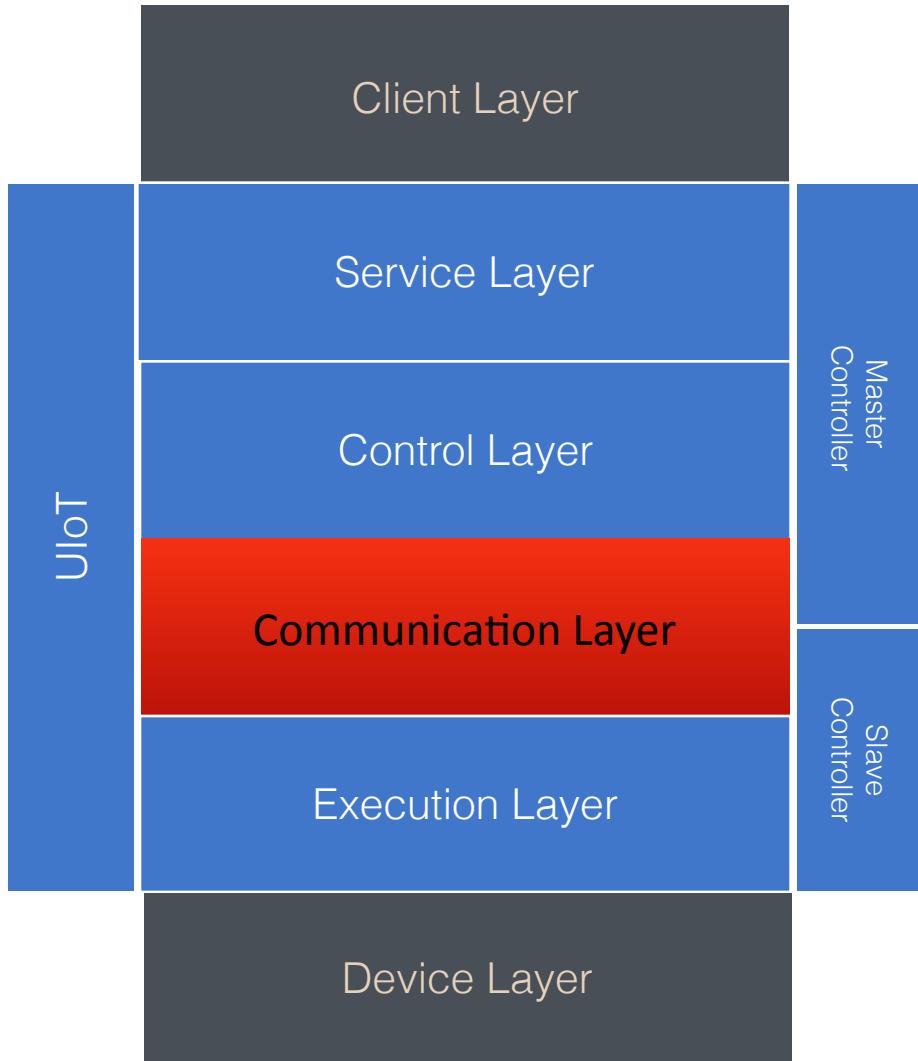
}



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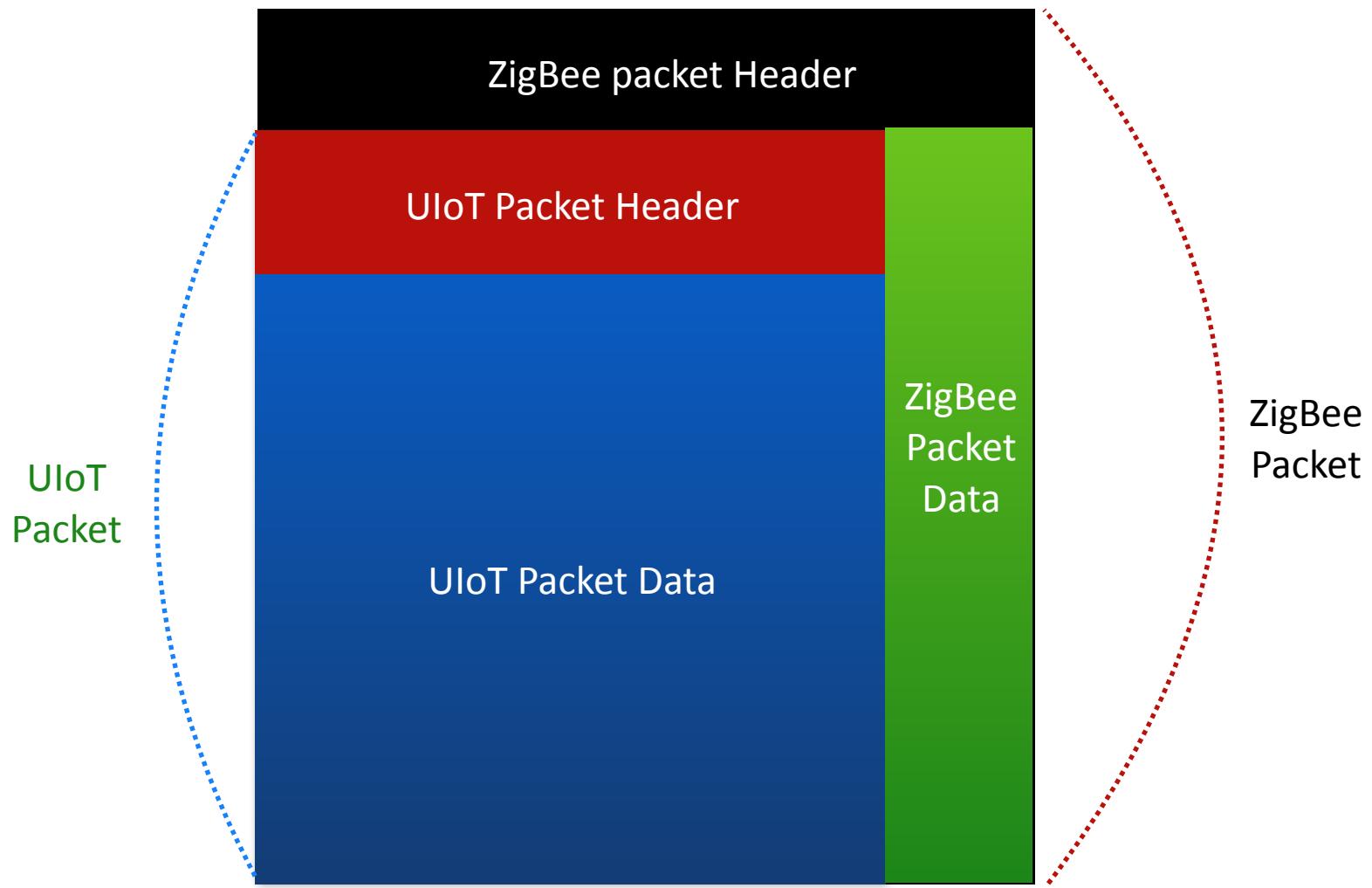


Solution Layers





Architectures - UIoT





Architectures - UIoT

Control packet

Field	Content	Length	Allowed Values
0	ZigBee header	24 bytes	Not applicable
1	UIoT Start byte	1 byte	0xFF
2	Message Id	2 bytes	from 0x00 0x00 to 0xFF a 0xFF
3	Data length	Unlimited	Byte string ended with 0x00
4	Pin Number	1 byte	From 0x00 to 0xFF
5	Pin Operation mode	2 bits	00 – Digital 01 – Analog 10 – PWM 11 - UART
6	Data type	2 bits	00 – Integer 01 – Boolean 10 – ASCII Text 11 – Long
7	Baudrate	4 bits	0000 – 0 0001 – 75 0010 – 150 0011 – 300 0100 – 600 0101 – 1200 0110 – 2400 0111 – 4800 1000 – 9600 1001 – 14400 1010 – 16457 1011 – 19200 1100 – 28800 1101 – 38400 1110 – 57600 1111 – 11520
8	Data to be written in field's 4 pin	Unlimited*	Byte string with length specified in field 3

*UIoT packet might be separated if exceed ZigBee's packet length



ACK packet

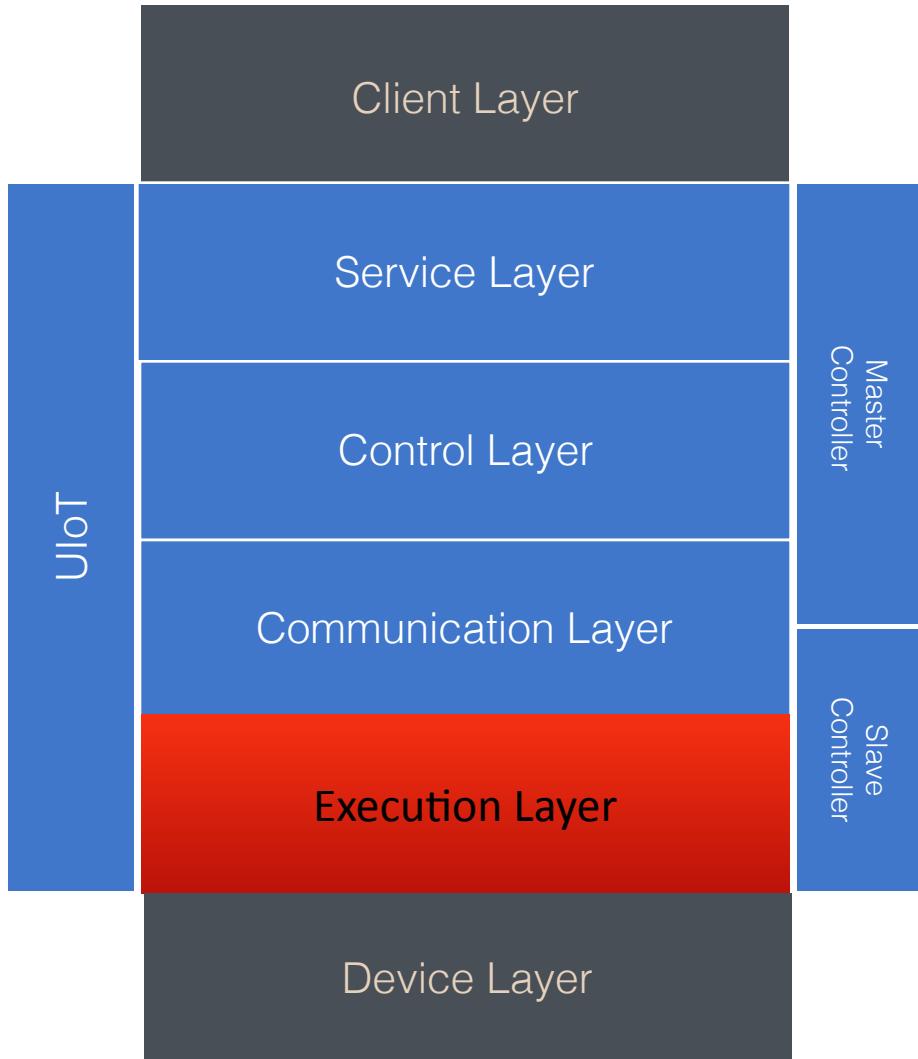
Field	Content	Length	Allowed Values
0	ZigBee Header	24 bytes	Not Applicable
1	UIoT Start Byte	1 byte	0xFF
2	Message identifier	2 bytes	From 0x00 0x00 to 0xFF 0xFF
3	Status	1 byte	0x00 – Success 0x01 – Invalid Pin 0x02 – Pin don't supported operation mode 0x03 – Pin don't support baudrate 0x04 – Pin don't support data type 0xFF – Unknown error

Eventing packet

Field	Content	Length	Allowed Values
0	ZigBee Header	24 bytes	Not Applicable
1	UIoT Start Byte	1 byte	0xAA
2	Message identifier	2 bytes	From 0x00 0x00 to 0xFF 0xFF
3	Data length	Unlimited	Byte string ended with 0x00
4	Pin number	1 Byte	From 0x00 to 0xFF
5	Data read on field's 3 pin	Unlimited*	Byte string with length specified in field 3

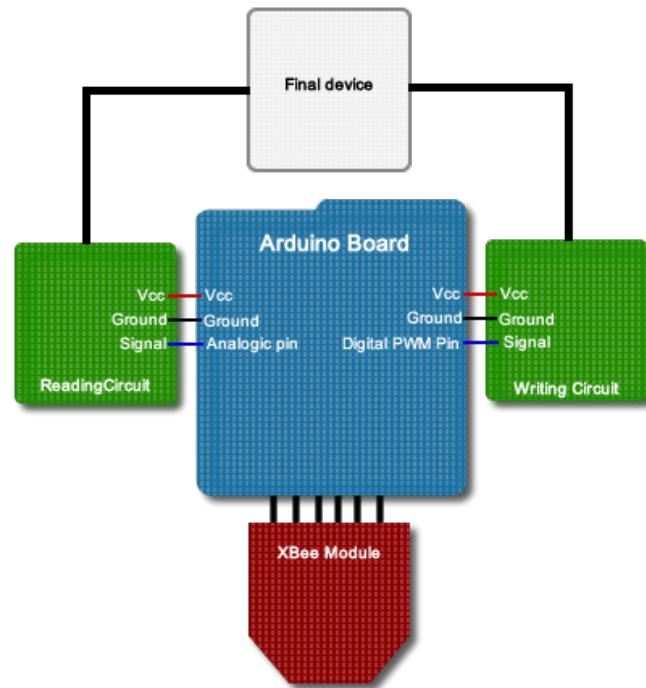
*UIoT packet might be separated if exceed ZigBee's packet length

Solution Layers

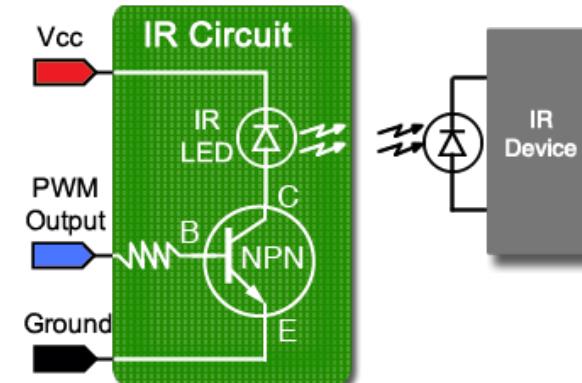
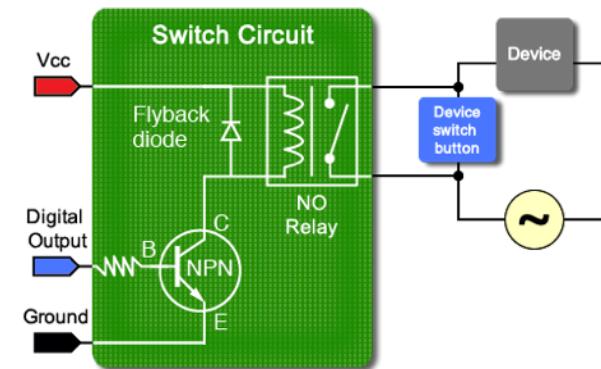




End device integration



Write circuits





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Nome do dispositivo	Serviço	Ação	Variável de estado	Valores permitidos para a variável de estado	Círculo de leitura (análogo)	Círculo de escrita
Higrômetro	monitor	<u>ler_humidade</u>	humidade	De 0 a 1023	Sensor de humidade (YL-38)	--

Monitor de Humidade

Nome do dispositivo	Serviço	Ação	Variável de estado	Valores permitidos para a variável de estado	Círculo de leitura	Círculo de escrita
Lâmpada	energia	ajustar_energia	energia	ligado, desligado	Sensor de Luminosidade (i0526018)	Círculo de chaveamento

Controle de Iluminação

Nome do dispositivo	Serviço	Ação	Variável de estado	Valores permitidos para a variável de estado	Círculo de leitura	Círculo de escrita
Detector de fumaça	monitor	<u>existe_fumaca</u>	fumaça	verdadeiro, falso	Sensor de fumaça (MN-EB-MQ2GS)	--
Alarme	sirene	ajustar	som	ligado, desligado	--	Sirene (YL-44)
Esguicho de água	Irrigação	ajustar_energia	energia	ligado, desligado	Sensor de voltagem (LM393-3144)	Círculo de chaveamento

Detecção de Incêndio



Architectures - UIoT

Nome do dispositivo	Serviço	Ação	Variável de estado	Valores permitidos para a variável de estado	Círculo de leitura	Círculo de escrita
Higrômetro de solo	monitor	<u>ler_humidade</u>	humidade	De 0 a 1023	Sensor de humidade do solo (YL-69)	--
Esguicho de água	irrigação	ajustar_energia	energia	ligado, desligado	Sensor de voltagem (LM393-3144)	Círculo de chaveamento

Irrigação Automática

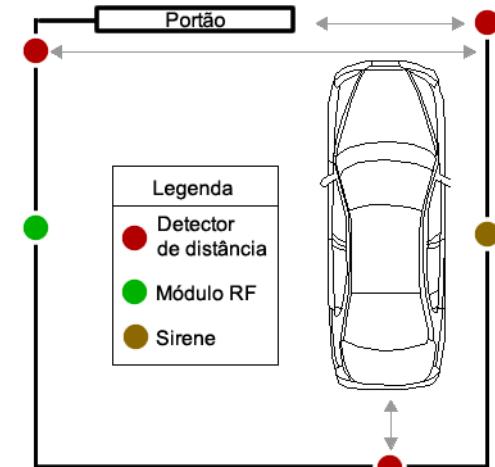
Nome do dispositivo	Serviço	Ação	Variável de estado	Valores permitidos para a variável de estado	Círculo de leitura	Círculo de escrita
Ar condicionado e aquecedor	ajustar	mudar_temperatura	temperatura	De 15 a 30	Medidor de temperatura do ar (DS18B20)	Círculo IR
		<u>mudar_modo_operacao</u>	<u>modo_de_operacao</u>		Aquecer, gelar	--
	energia	ajustar_energia	energia	ligado, desligado	--	Círculo IR
Termômetro	monitor	medir_temperatura	temperatura	-55 to 125	Medidor de temperatura do ar (DS18B20)	--

Controle de Temperatura



Estacionamento

Nome do dispositivo	Serviço	Ação	Variável de estado	Valores permitidos para a variável de estado	Círculo de leitura	Círculo de escrita
Alarme	sirene	ajustar	som	ligado, desligado	--	Sirene (YL-44)
Portão	mover	<u>mudar_posicao</u>	movimento	Abrir, fechar, parar	--	Círculo RF
	medidor	<u>medir_distancia</u>	distancia	De 2 a 400	Detector de distância (HC-SR04)	--
		<u>ler_se_esta_obstruido</u>	distancia			--
Carro	distancia_parede	<u>medir_distancia</u>	distancia			--



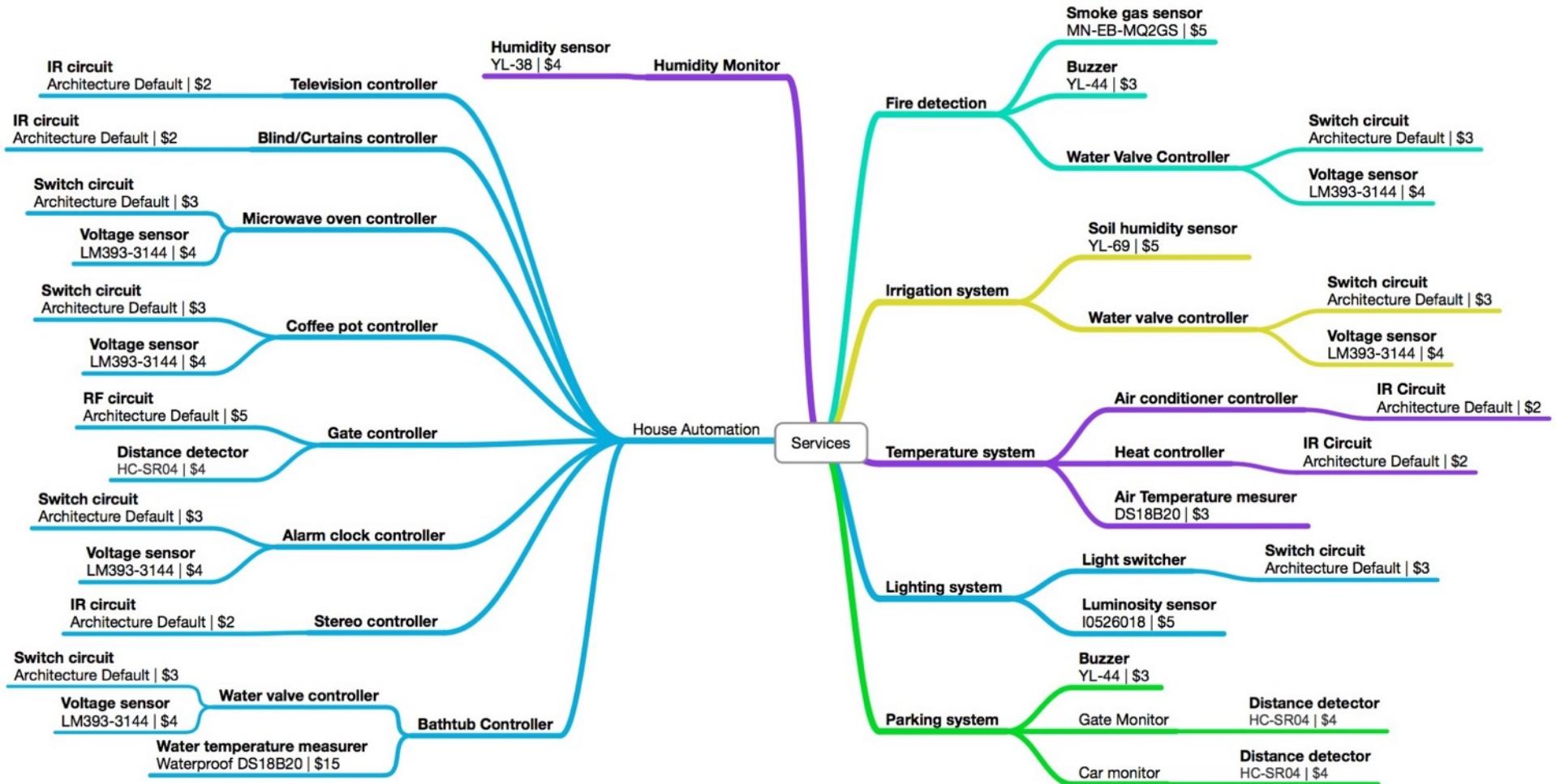


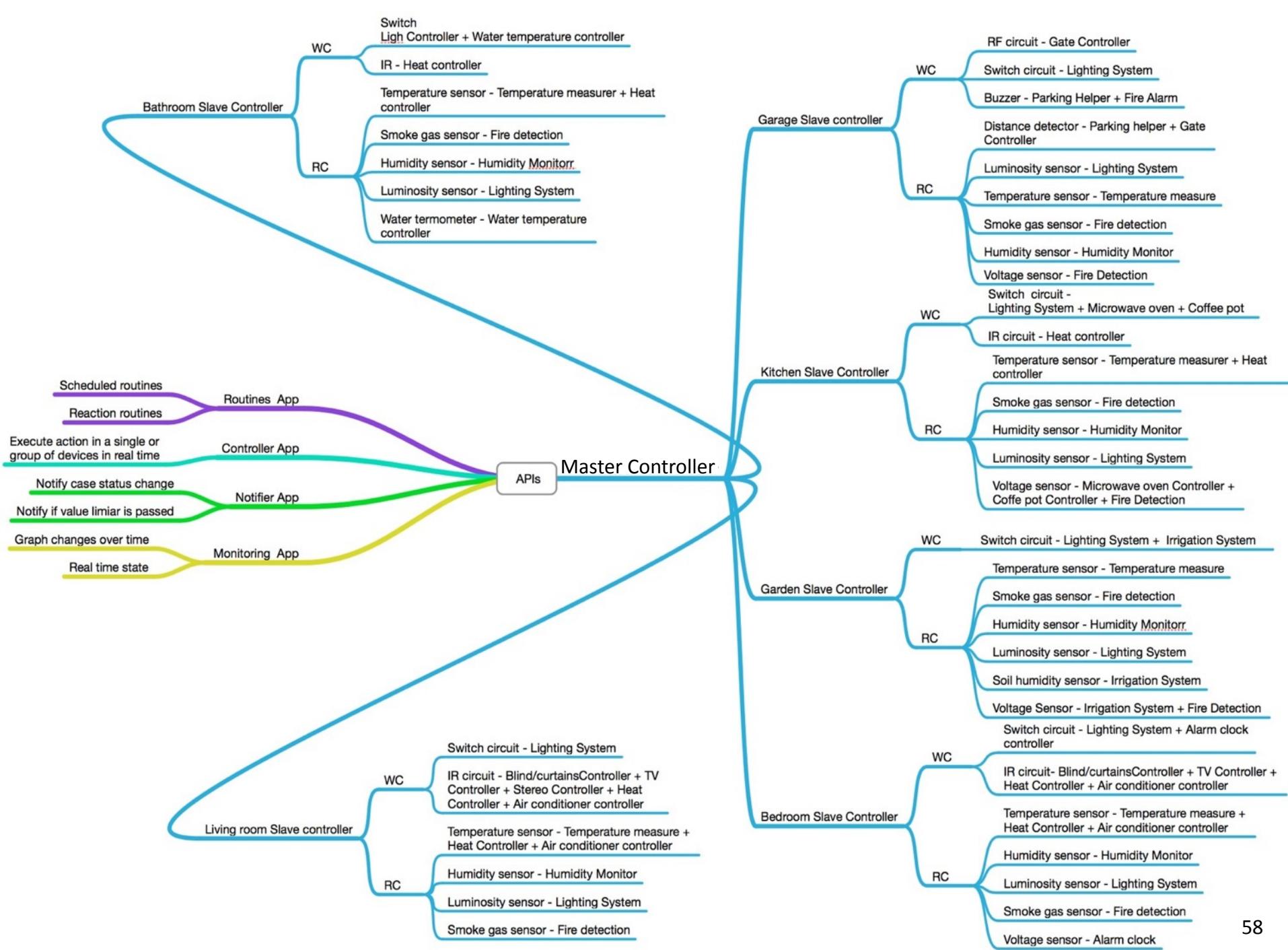
Architectures - ULoT

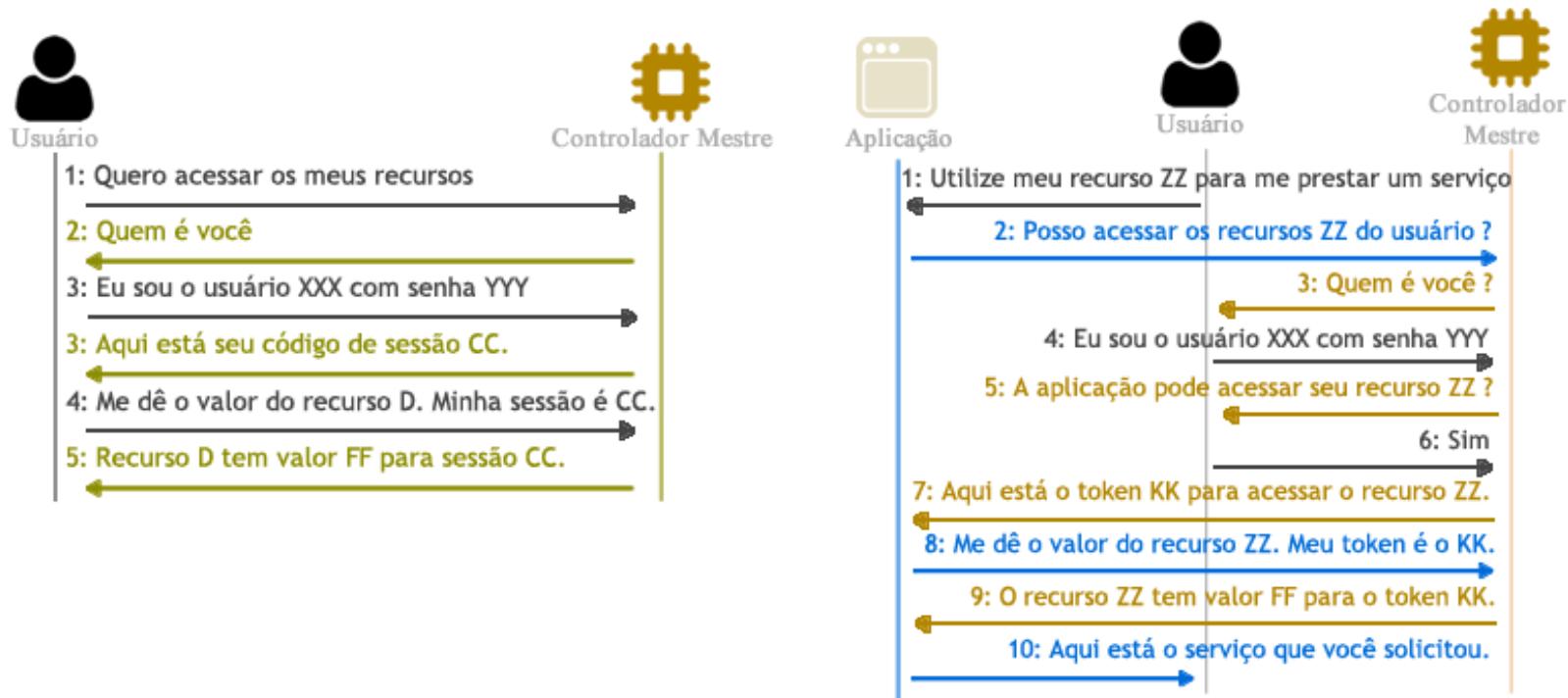
Nome do dispositivo	Serviço	Ação	Variável de estado	Valores permitidos	Círculo de leitura	Círculo de escrita
TV	ajustador	mudar_canal	canal	De 1 a 1000	--	
		mudar_volume	volume	De 1 a 100	--	Círculo IR
	energia	ajustar_energia	energia	ligado,	--	
Cortina	mover	mudar_posicao	movimento	Abrir,	--	Círculo RF
Cafeteira	energia	ajustar_energia	energia	ligado,	Sensor de voltagem (LM393-3144)	Círculo de chaveamento
Portão	mover	mudar_posicao	movimento	Abrir,	--	Círculo RF
	posicao	ler_posicao	distancia	De 2 a 400	Detector de distância	--
Sistema de Som	energia	ajustar_energia	energia	ligado,	--	
		mudar_volume	volume	1 to 100	--	Círculo IR
	ajustar	mudar_estacao	estacao	1 to 6	--	
Banheira	Ajustar_agua	esquentar	atuador_	aberta,	Sensor de voltagem (LM393 -3144) com válvula pneumática eletrônica (EV-3M)	
		esfriar	atuador_	aberta,		
		esvaziar	atuador_	aberto,		Círculo de chaveamento
	medir	ler_temperatura	temperatur	-55 to 125	Medidor de temperatura da água(DS18B20 à prova d'água)	



Architectures - UIoT

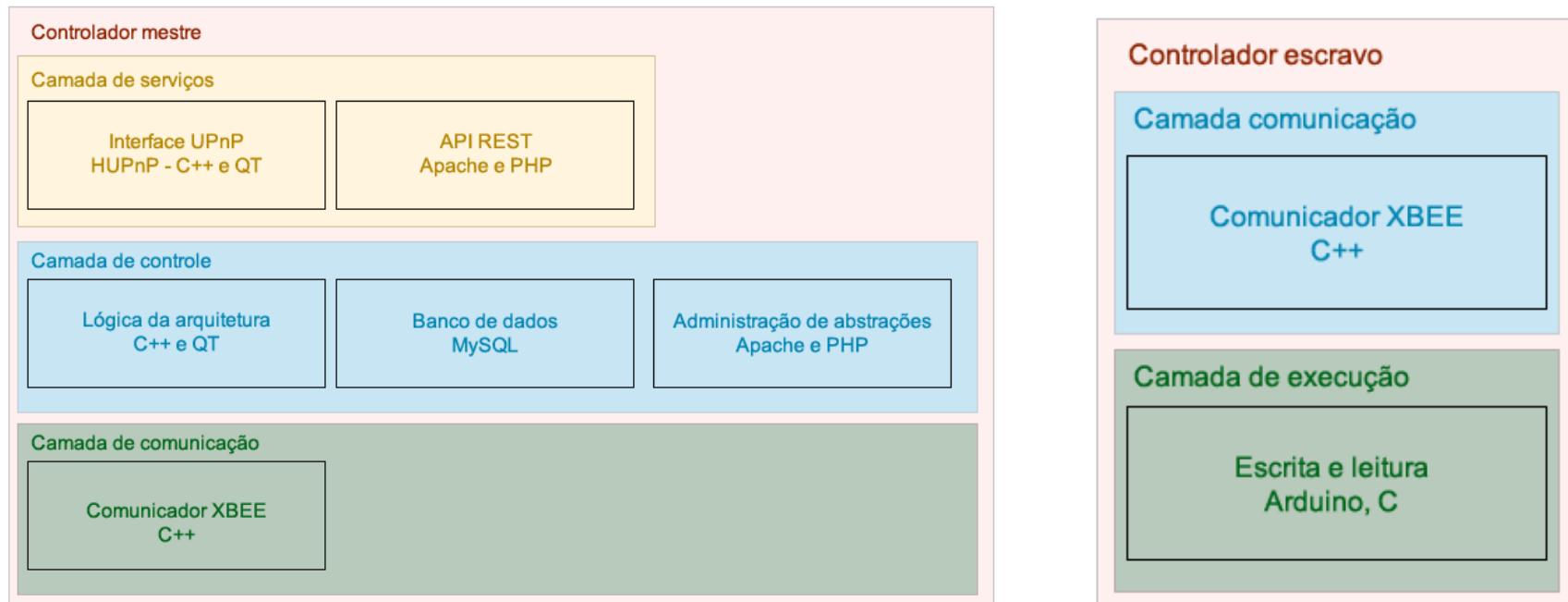








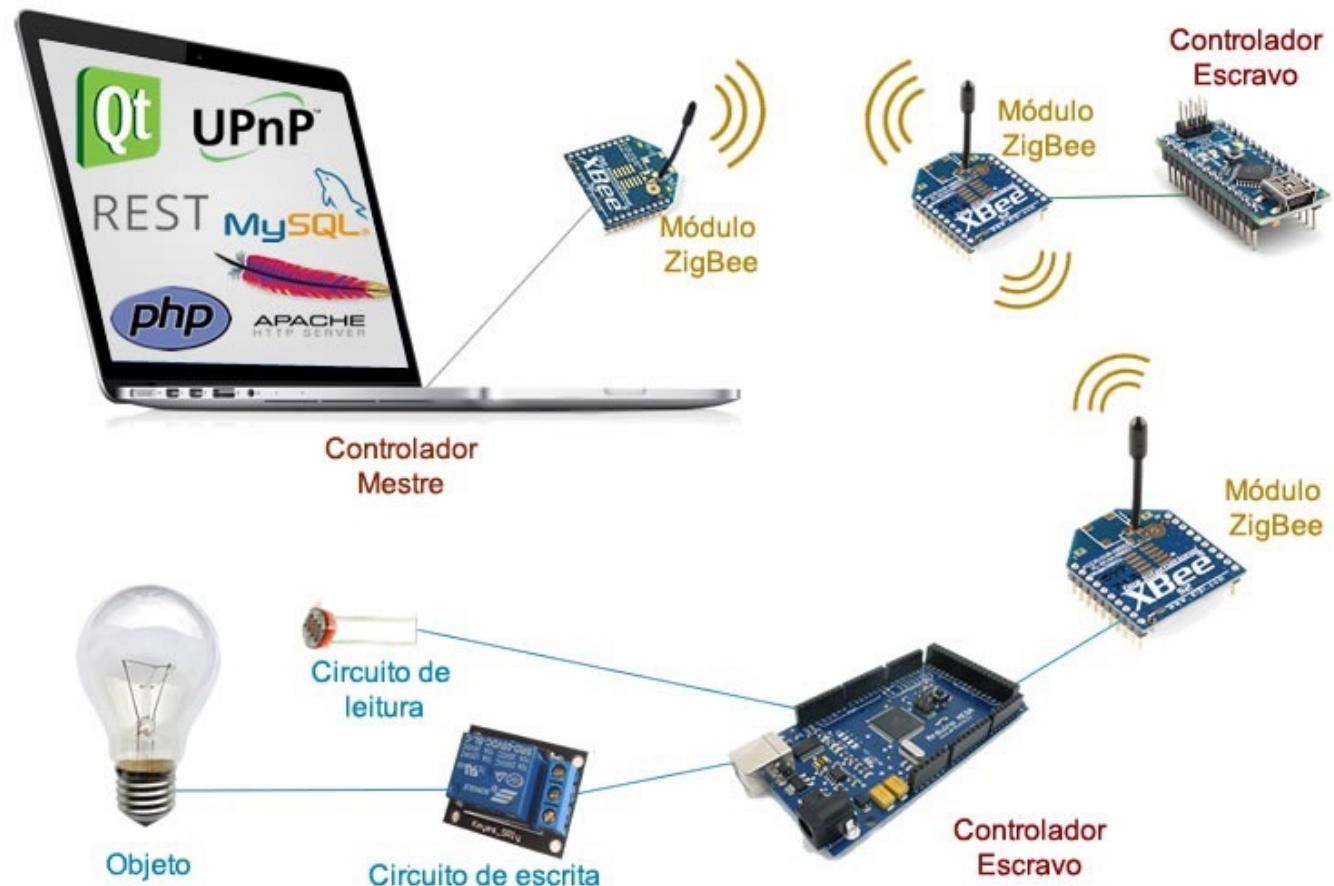
Architectures - UIoT





Architectures - UIoT

LabRedes





http://25.94.102.10/api/control/classroom/13/18/set_power?power=1

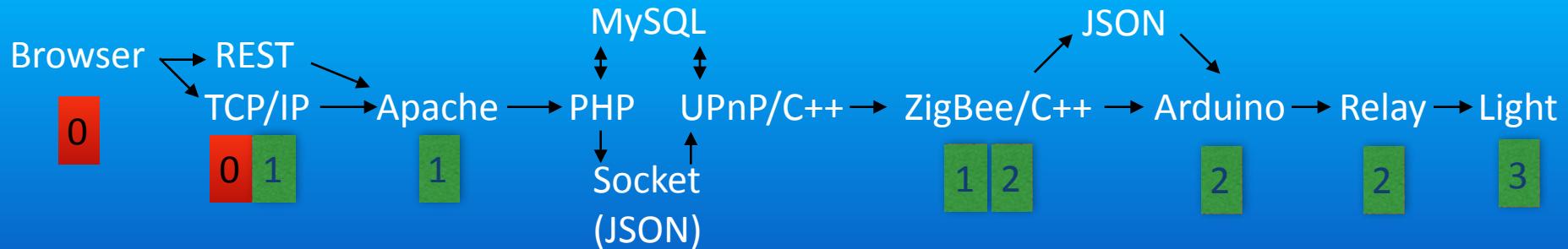


9.807Km

South Atlantic Ocean

3
2
1

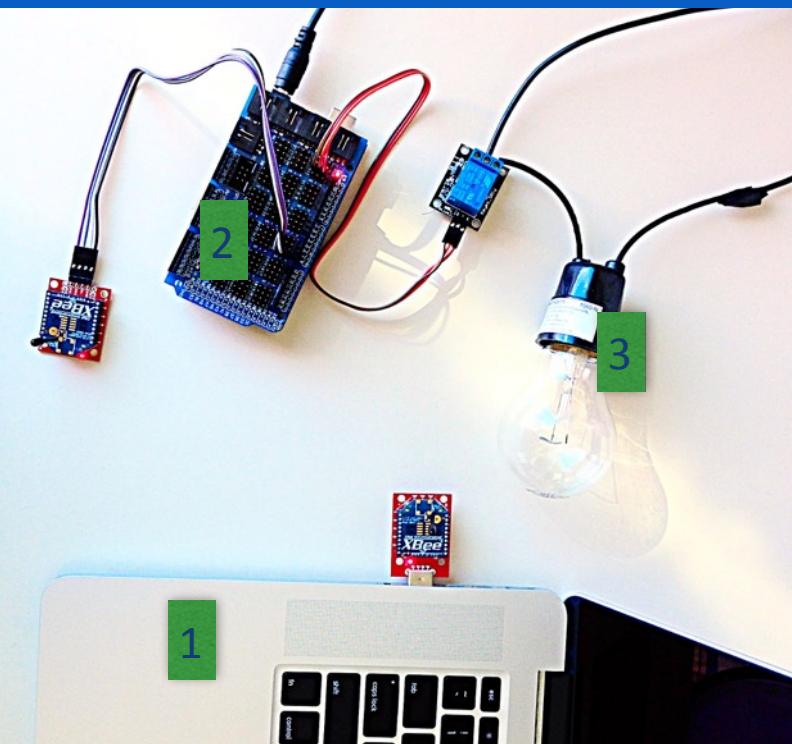
0



Slave controller	Classroom
Device	Light
Service	Power Handler
Action	Set power
Variable	power

Diagram illustrating the hierarchical control structure:

- Application 1**, **Application 2**, ..., **Application n** interact with a **Master controller** (1).
- The **Master controller** (1) oversees **Slave Controller 1**, **Slave Controller 2**, ..., **Slave Controller n** (2).
- Slave Controller 1**, **Slave Controller 2**, ..., **Slave Controller n** manage various **Device** components (3).



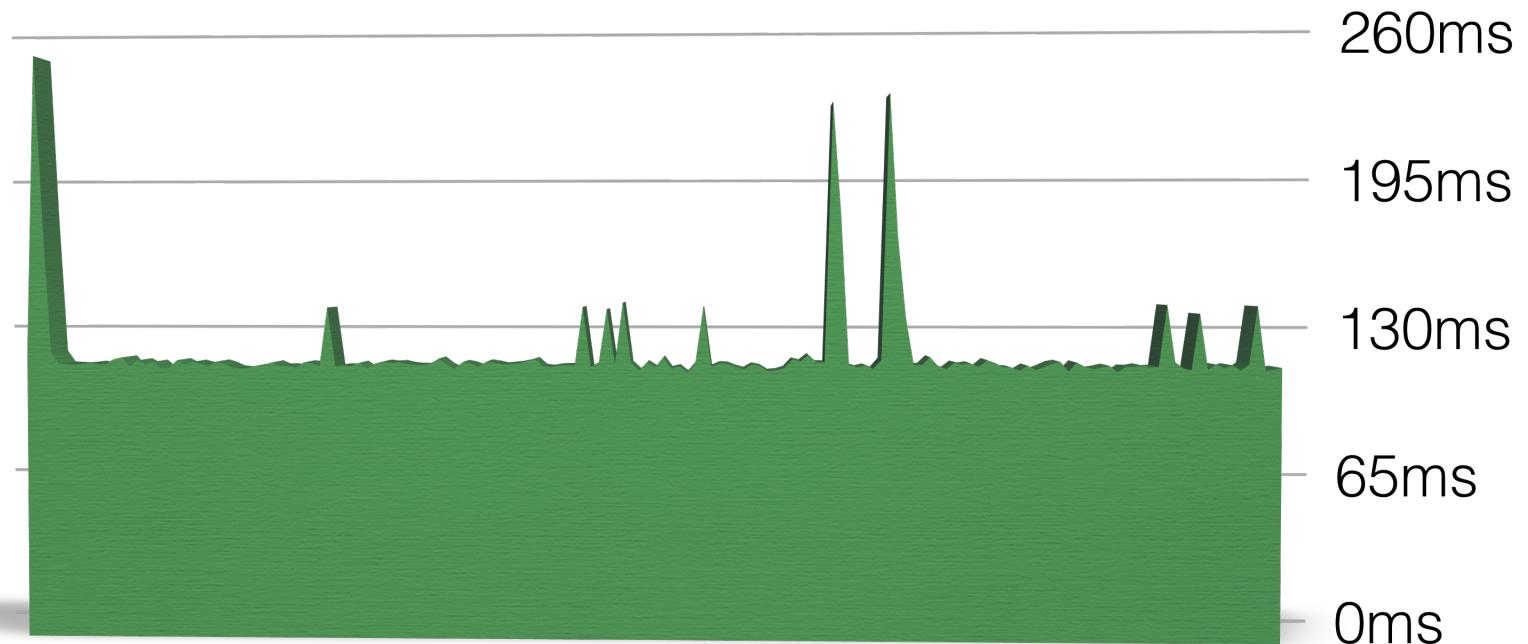


Tempo 300 requisições em 30 segundos

LabRedes

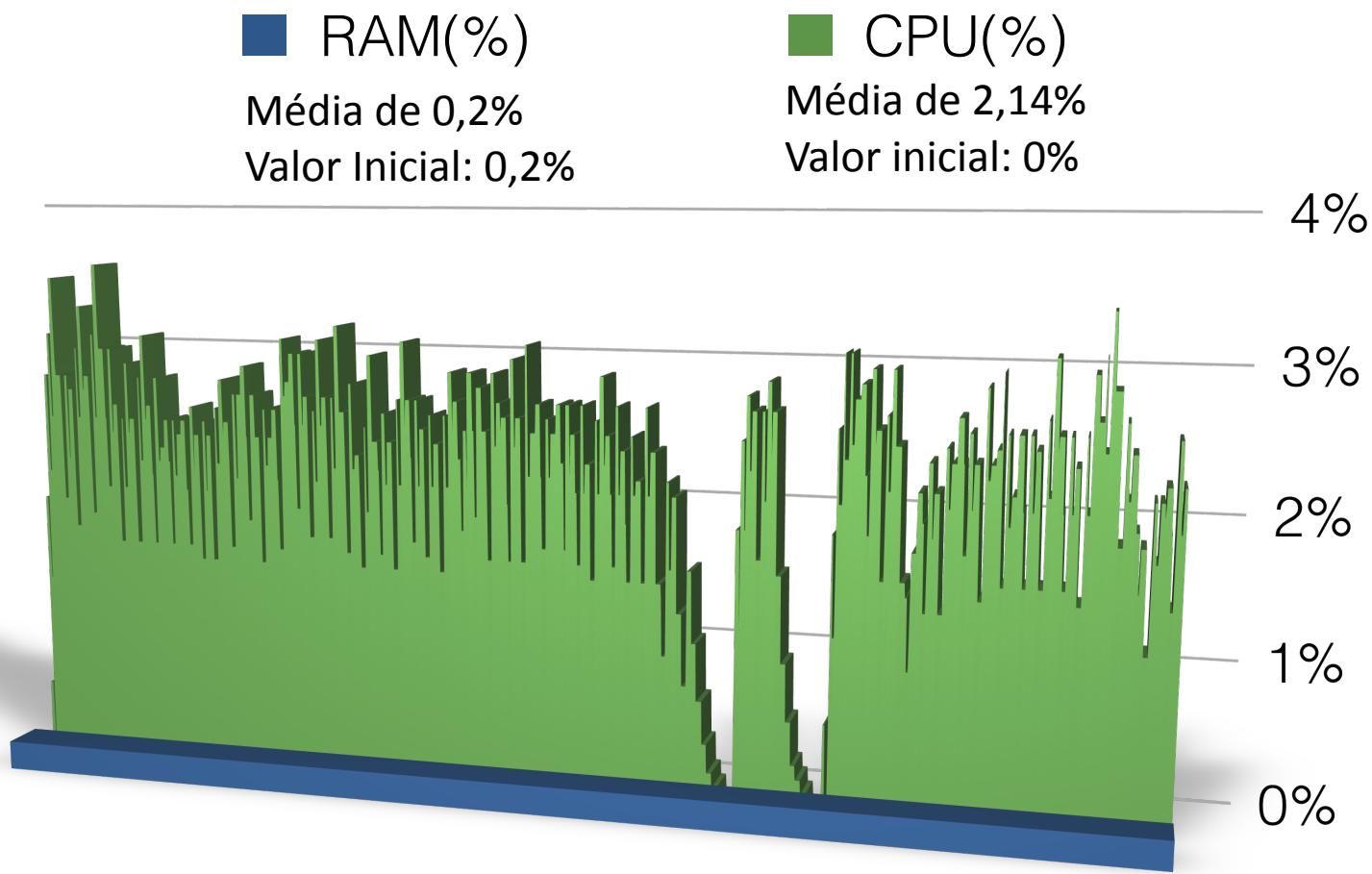
■ Tempo(ms)

Média de 120.3ms



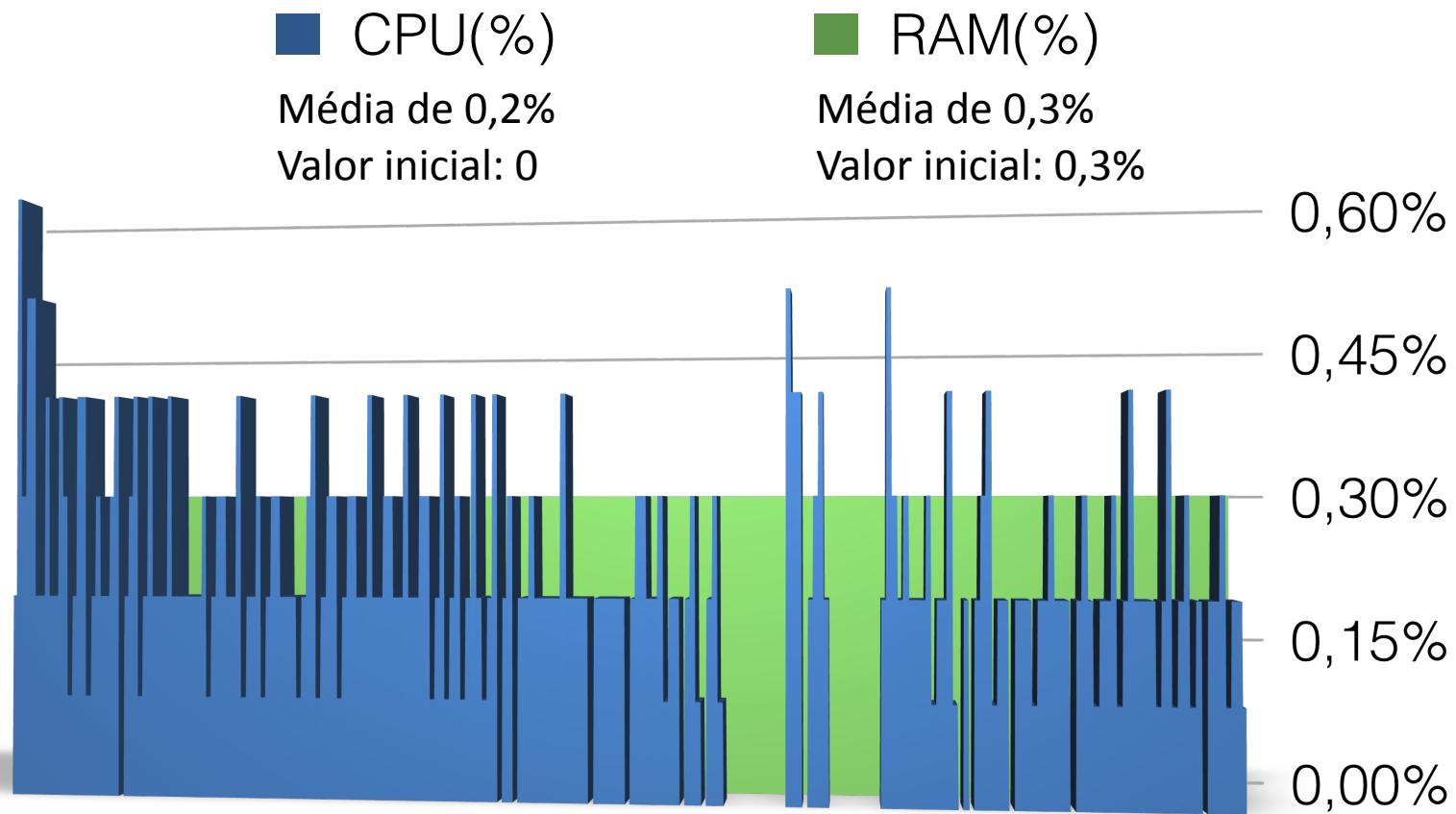


QT - 300 requisições 30 s



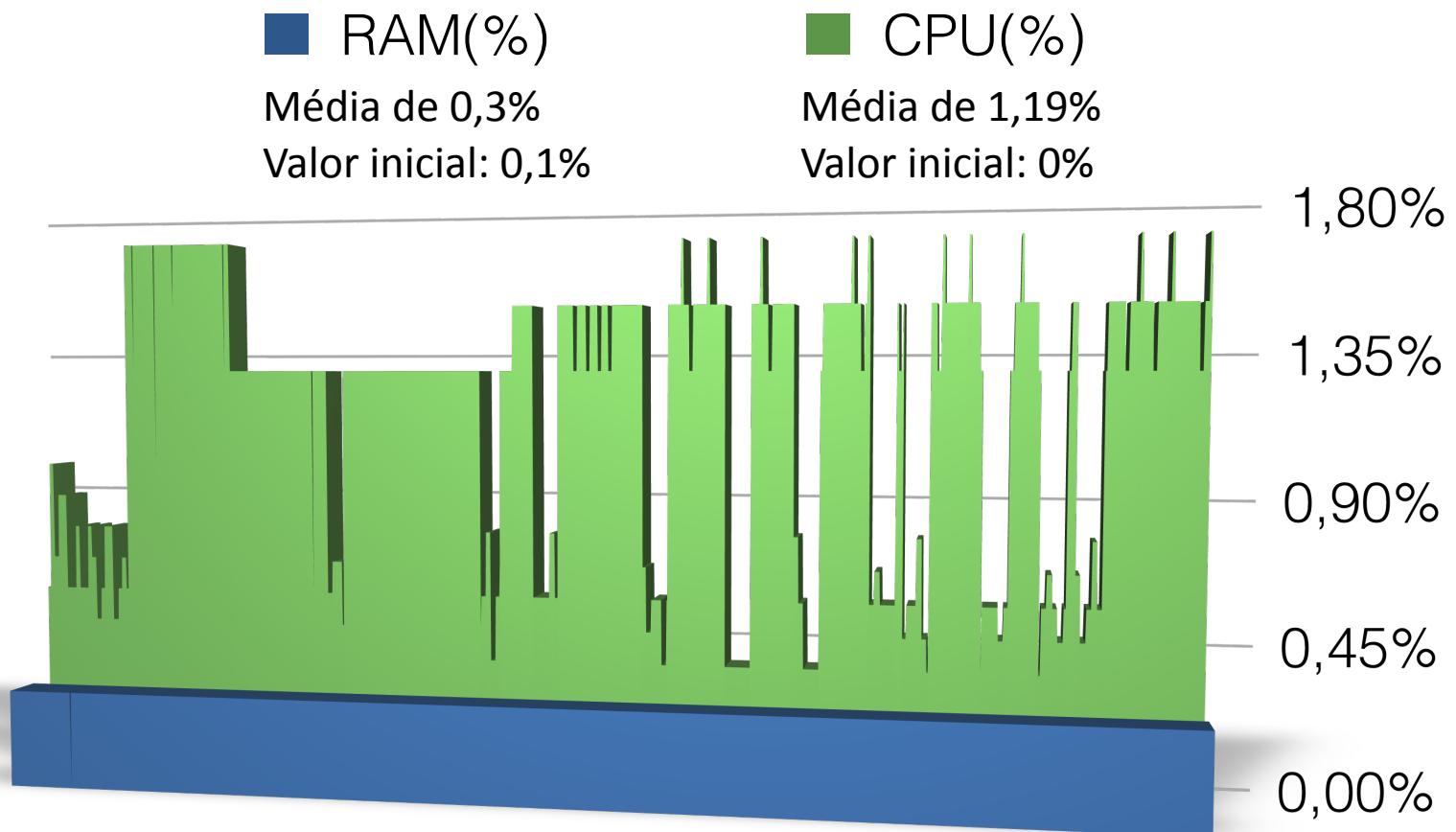


MySQL - 300 requisições 30 s



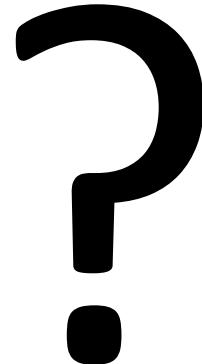


Apache - 300 requisições 30 s





Questions?



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