



Workshop 23

Environment Design to Sustain Users

AAL Forum 2016
26-28 September 2016
St. Gallen, Switzerland

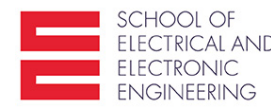
Dr John McGrory
Dublin Institute of Technology



Dr Matteo Zallio
Dublin Institute of Technology

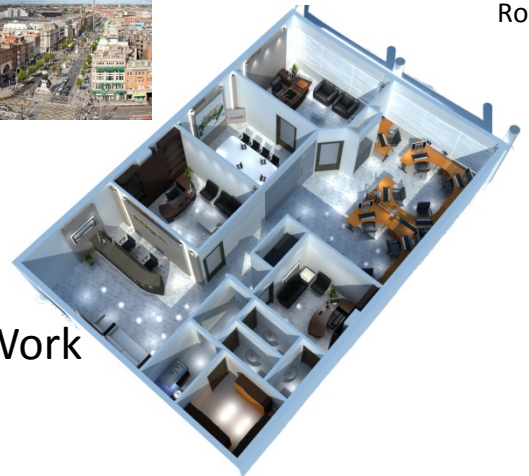


Ecosystem - People



Utility Company

Work



Road terrain & other vehicles/people



Car

Home



Utility Company



Social Groups



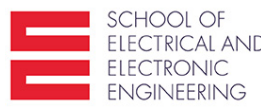
Family

Connections

- Interfaces
- Emotional
- Direct sensory

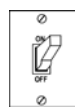
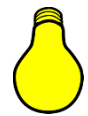
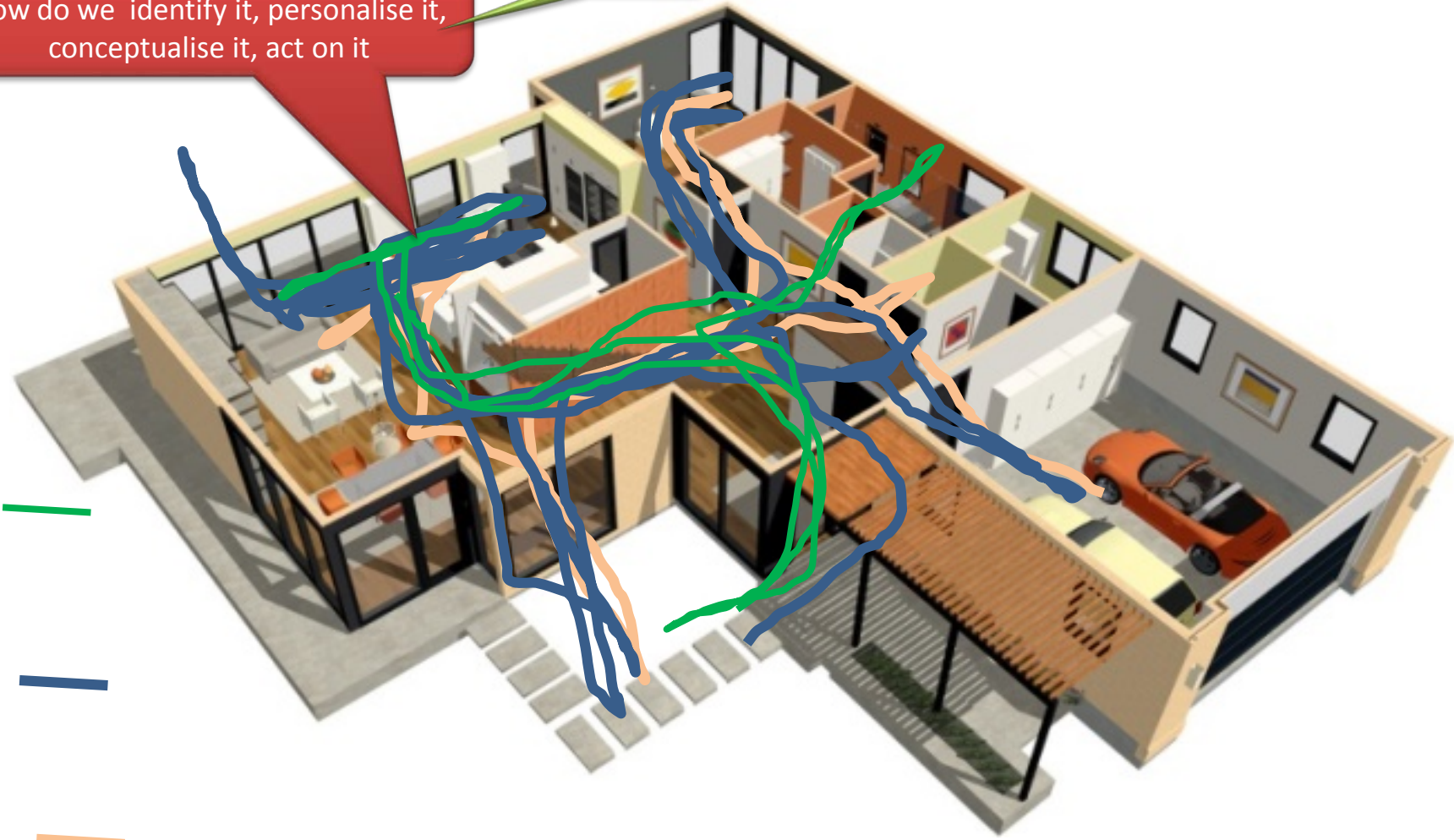


Ecosystem - Homes



Overlap or Common Patterns
How do we identify it, personalise it, conceptualise it, act on it

Form, Fit Function



System Patterns - Example

Flood Light Fitting



Light Detection (Darkness)

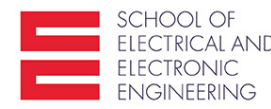


Presence Detection

Industrial Integrated Solution



System Patterns - Example



Now
Individual key
Adjust seat
Adjust control sensitivity

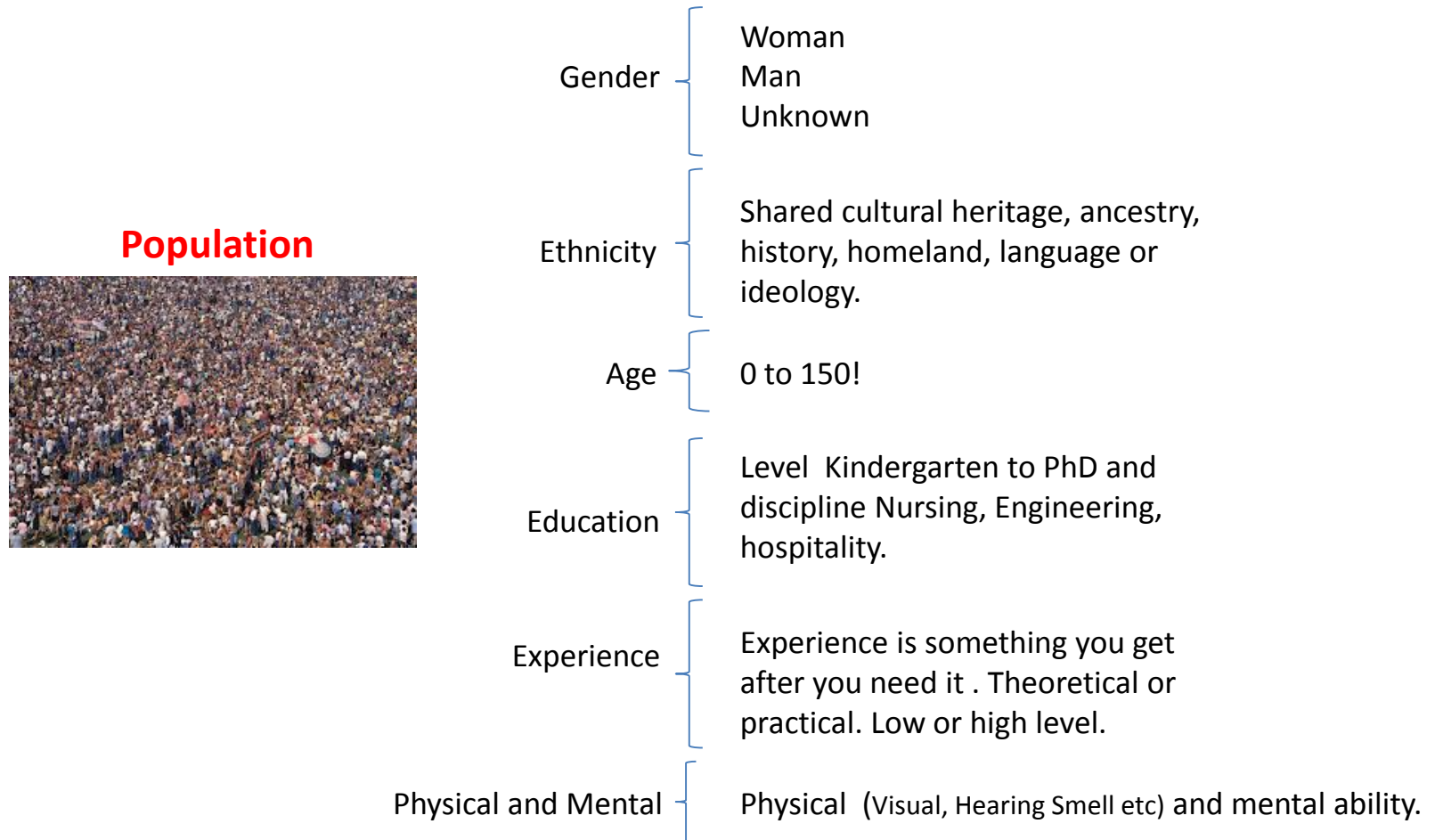


These common patterns have weightings and context for individuals

Offer customised personalised experience

Ecosystem Deviation Population

A persons “connection” to the ecosystem is based on a number of factors:



Every one of these and many other factors affects the individuals “connection”.

Perfect User Experience in Sustainable Design?

So you want me to show you **a perfect user experience in sustainable design** that is suited to every member of the population equally?

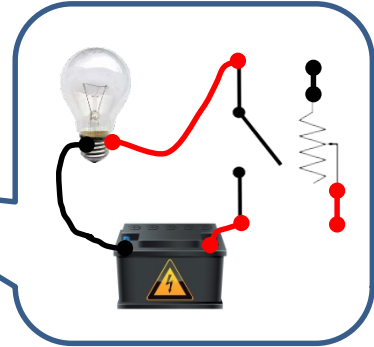


Now YOU are talking Fantasy and Fiction!

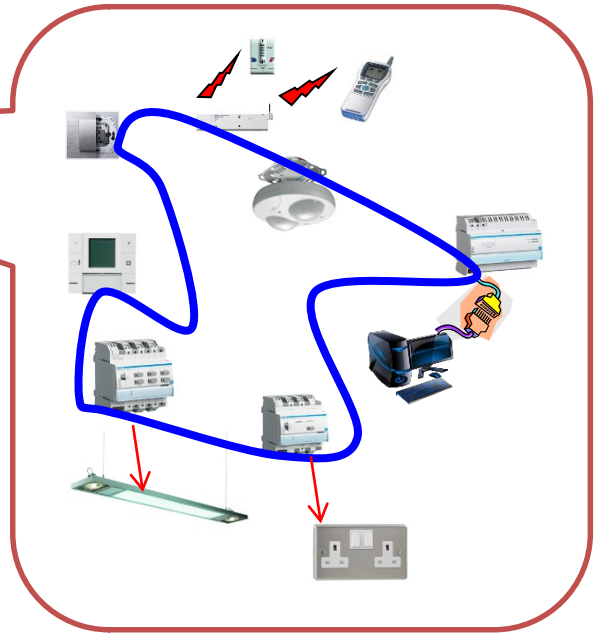
But we will show you today some tricks and knowledge you need to employ, so YOU....yes....YOU can be better prepared.

Discussion of Systems

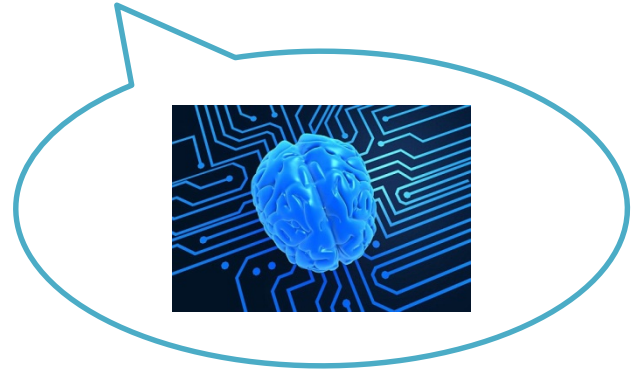
Traditionally Wired System
On/Off and Analogue



Fieldbus Wired System



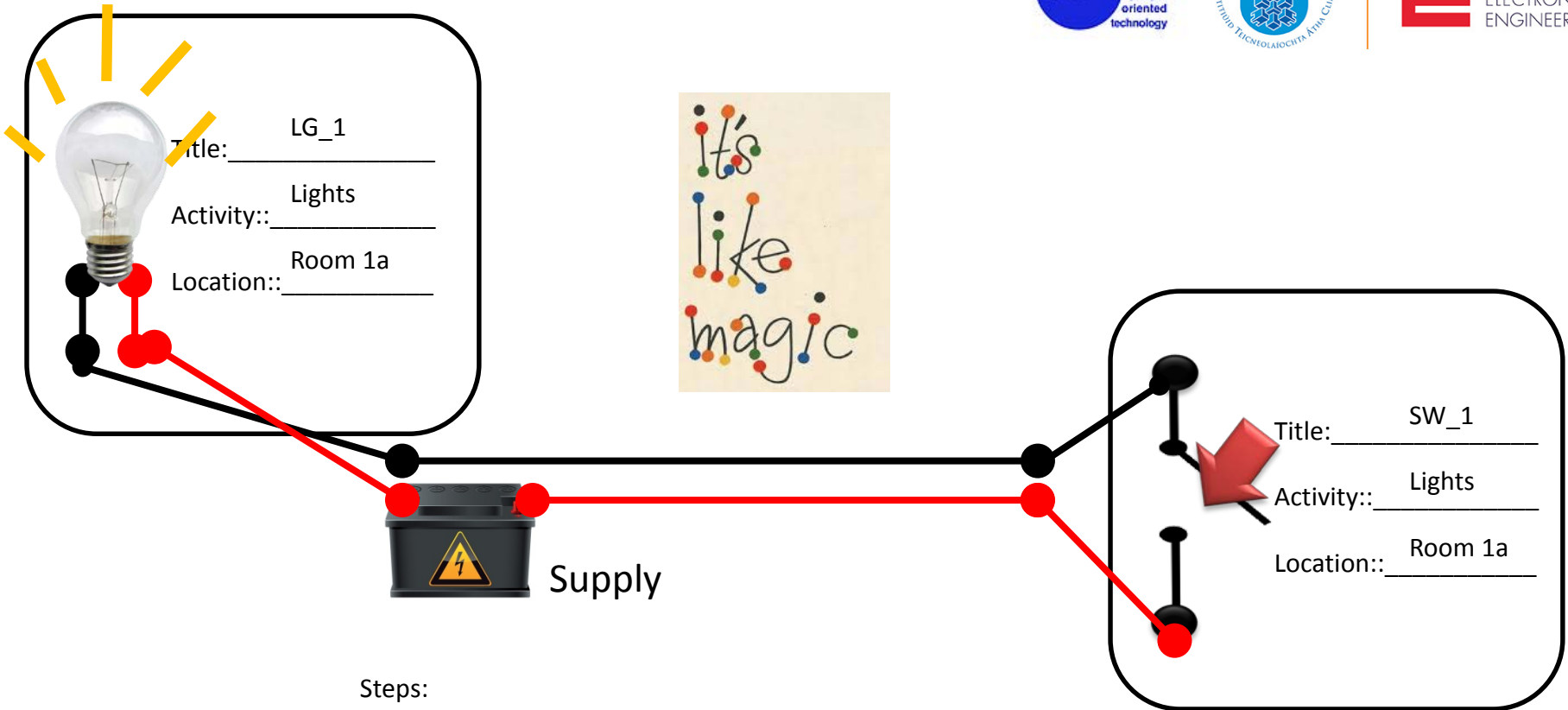
Intelligent Wired System



Warning
Simplistic View
To show issues and concepts



Traditionally Wired System – On/Off



Steps:

1. Place the components switch and light
2. Place the wiring
3. Label the system.

Hence a basic lighting circuit.
The switch turns on the light



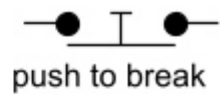
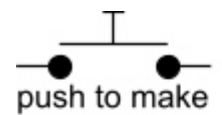
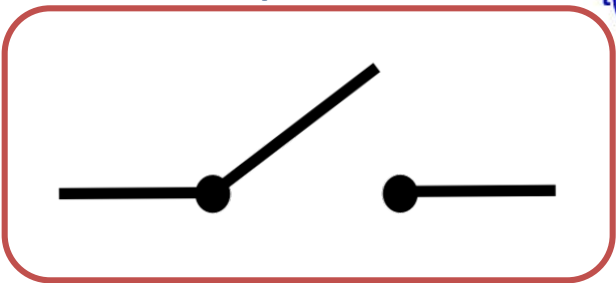
Warning

Cheap & Easy

But

Reuse/multiuse of signal?
Individual preferences

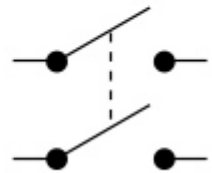
On/Off Sensor Switch Concept



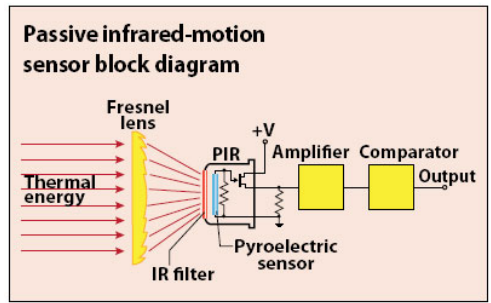
single pole single way or throw



single pole two way or throw



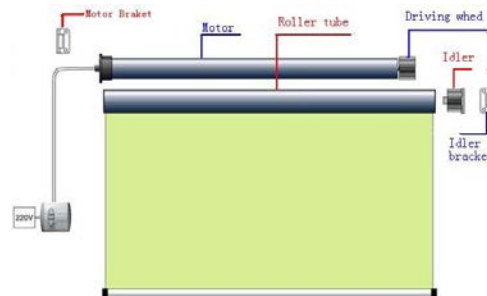
double pole single way or throw



On/Off Actuator Concept



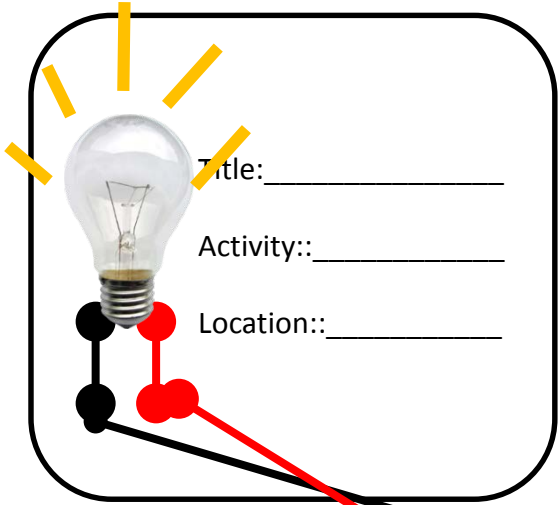
Doors, Gates, Fans



Blinds



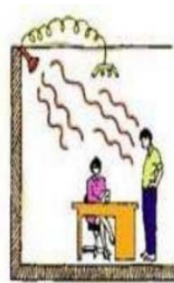
User in Traditionally Wired



Jane moved in bed



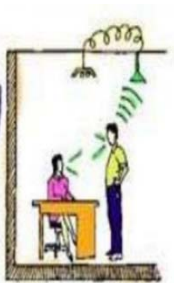
John stepped out of bed



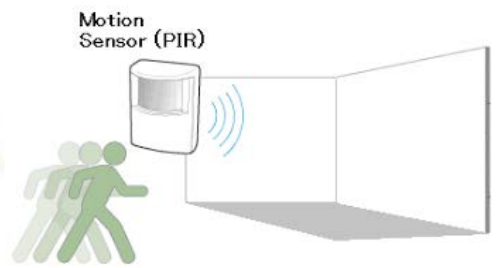
Infrared Detector



Ultrasonic system

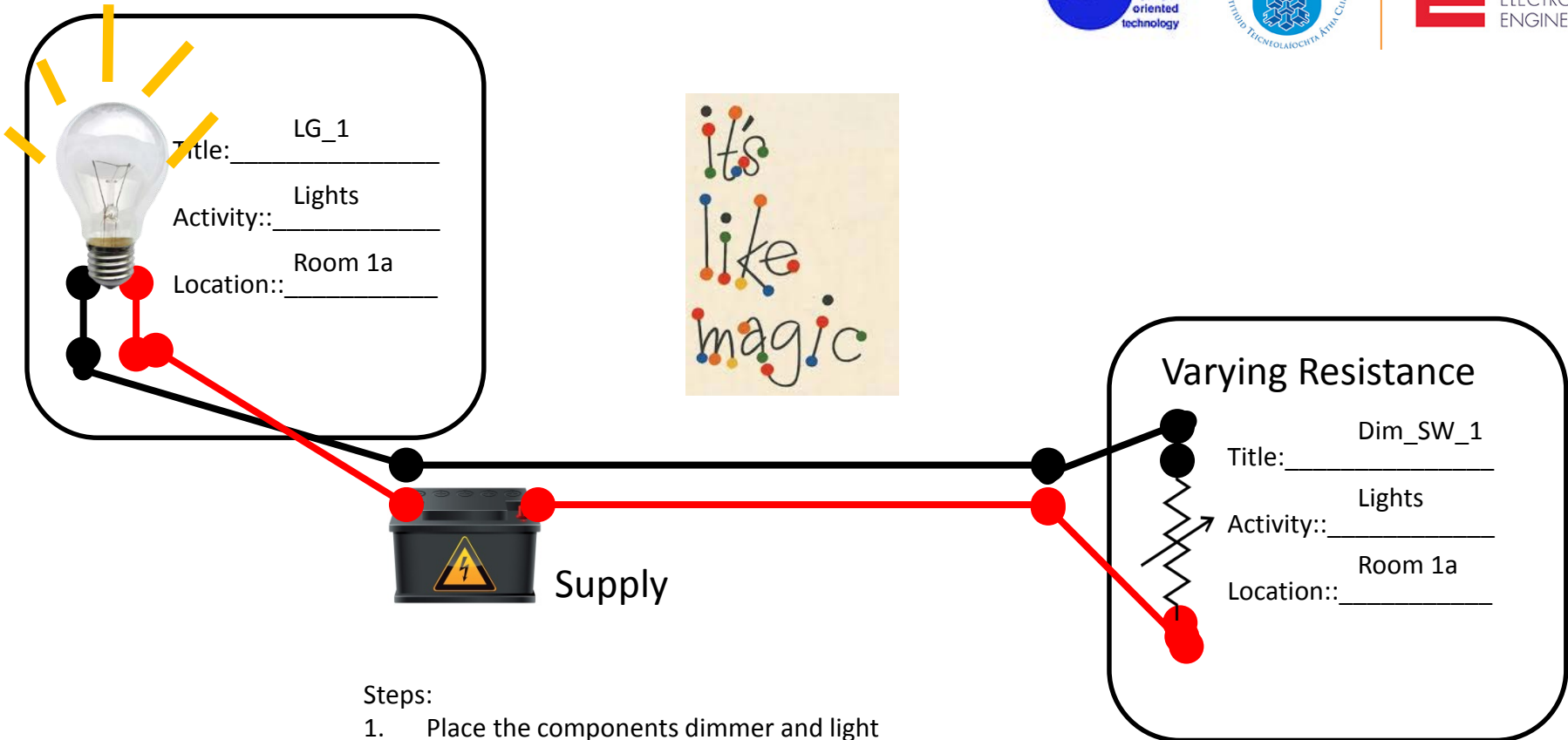


Acoustic sensor



James moved in a room

Traditionally Wired System -Analogue



Steps:

1. Place the components dimmer and light
2. Place the wiring
3. Label the system.

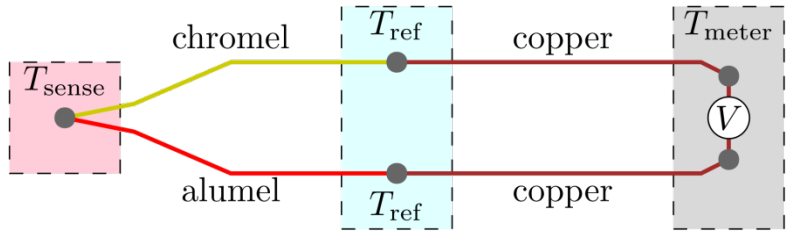
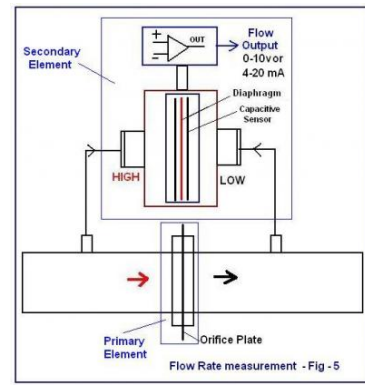
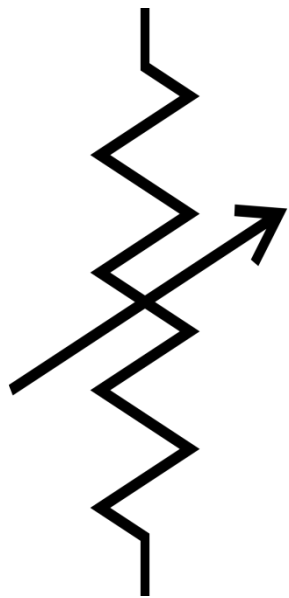
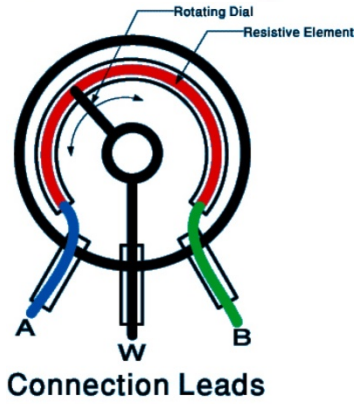
Hence a basic lighting circuit.
The switch turns on the light



Warning

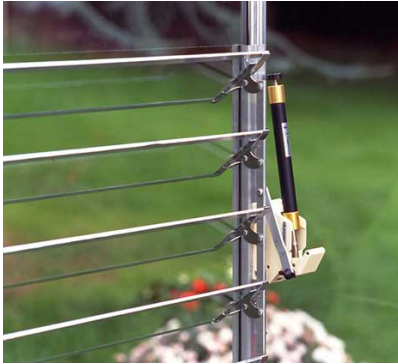
Cheap & Easy
But
Reuse/ multiuse of signal?
Individual preferences

Analogue Sensor Concept - Examples

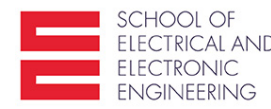


Warning
Could vary Voltage,
Resistance or Current to
do the same thing

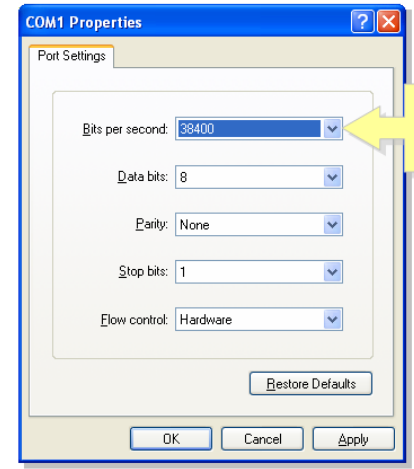
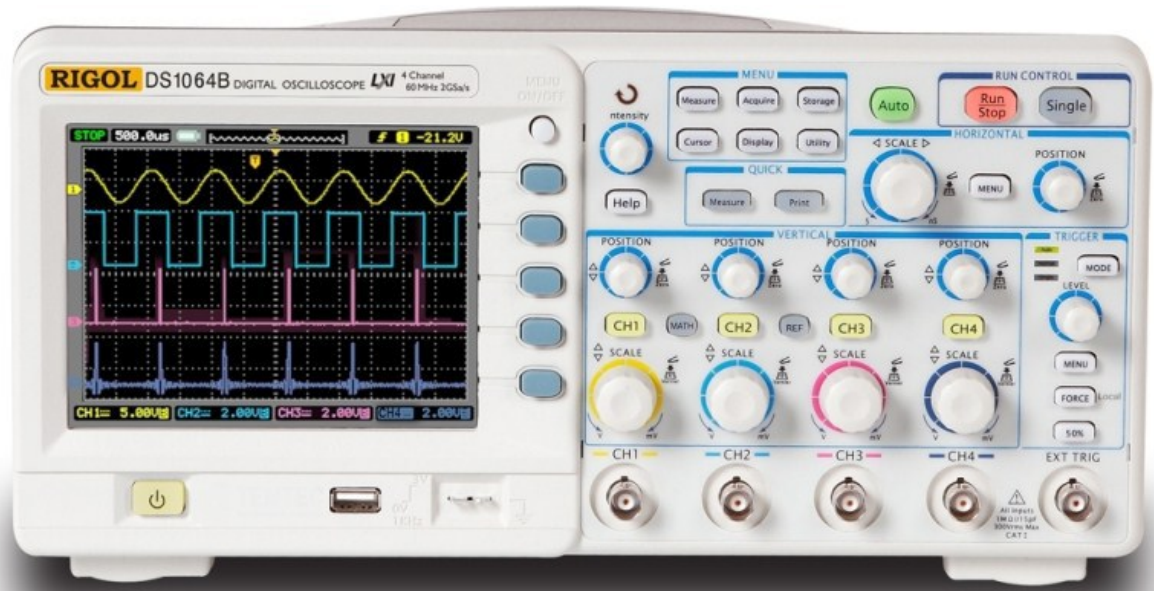
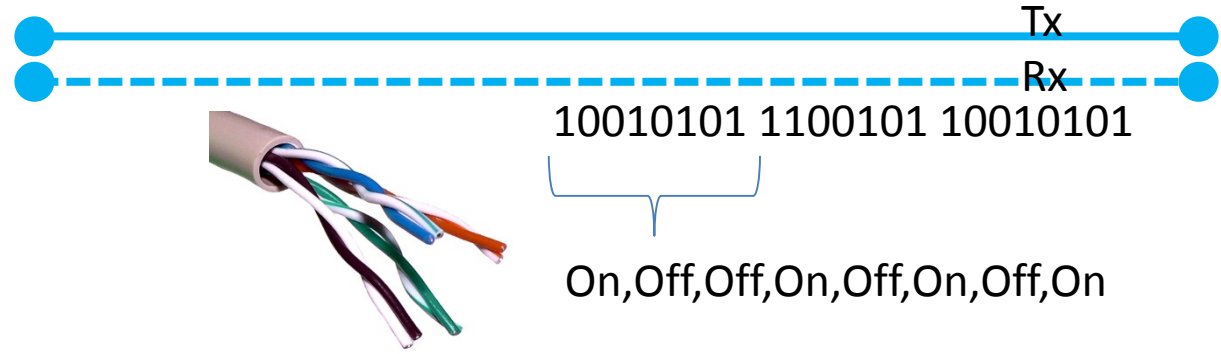
Analogue Actuator Concept -Examples



Fieldbus Concept - Simplified

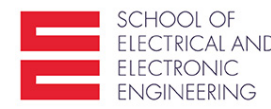


Circuit 1



This is the default baud rate of the switch.

Fieldbus Concept - Simplified

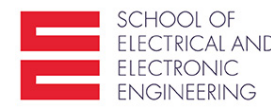


Dec	Hex	Oct	Bin	Char	Dec	Hex	Oct	Bin	Char	Dec	Hex	Oct	Bin	Char	Dec	Hex	Oct	Bin	Char
0	0x00	000	00000000	NUL	32	0x20	040	01000000	space	64	0x40	100	10000000	@	96	0x60	140	11000000	.
1	0x01	001	00000001	SOH	33	0x21	041	01000001	!	65	0x41	101	10000001	A	97	0x61	141	11000001	a
2	0x02	002	00000010	STX	34	0x22	042	01000010	"	66	0x42	102	10000010	B	98	0x62	142	11000010	b
3	0x03	003	00000011	ETX	35	0x23	043	01000011	#	67	0x43	103	10000011	C	99	0x63	143	11000011	c
4	0x04	004	00001000	EOT	36	0x24	044	01001000	\$	68	0x44	104	10001000	D	100	0x64	144	11001000	d
5	0x05	005	00001001	ENQ	37	0x25	045	01001001	%	69	0x45	105	10001001	E	101	0x65	145	11001001	e
6	0x06	006	00001100	ACK	38	0x26	046	01001100	&	70	0x46	106	10001100	F	102	0x66	146	11001100	f
7	0x07	007	00001101	BEL	39	0x27	047	01001101	'	71	0x47	107	10001101	G	103	0x67	147	11001101	g
8	0x08	010	00010000	BS	40	0x28	050	01010000	{	72	0x48	110	10010000	H	104	0x68	150	11010000	h
9	0x09	011	00010001	TAB	41	0x29	051	01010001	}	73	0x49	111	10010001	I	105	0x69	151	11010001	i
10	0x0A	012	00010010	LF	42	0x2A	052	01010010	*	74	0x4A	112	10010010	J	106	0x6A	152	11010010	j
11	0x0B	013	00010011	VT	43	0x2B	053	01010011	+	75	0x4B	113	10010011	K	107	0x6B	153	11010011	k
12	0x0C	014	00011000	FF	44	0x2C	054	01011000	,	76	0x4C	114	10011000	L	108	0x6C	154	11011000	l
13	0x0D	015	00011001	CR	45	0x2D	055	01011001	-	77	0x4D	115	10011001	M	109	0x6D	155	11011001	m
14	0x0E	016	00011100	SO	46	0x2E	056	01011100	.	78	0x4E	116	10011100	N	110	0x6E	156	11011100	n
15	0x0F	017	00011101	SI	47	0x2F	057	01011101	/	79	0x4F	117	10011101	O	111	0x6F	157	11011101	o
16	0x10	020	00100000	DLE	48	0x30	060	01100000	0	80	0x50	120	10100000	P	112	0x70	160	11100000	p
17	0x11	021	00100001	DC1	49	0x31	061	01100001	1	81	0x51	121	10100001	Q	113	0x71	161	11100001	q
18	0x12	022	00100010	DC2	50	0x32	062	01100010	2	82	0x52	122	10100010	R	114	0x72	162	11100010	r
19	0x13	023	00100011	DC3	51	0x33	063	01100011	3	83	0x53	123	10100011	S	115	0x73	163	11100011	s
20	0x14	024	00101000	DC4	52	0x34	064	01101000	4	84	0x54	124	10101000	T	116	0x74	164	11101000	t
21	0x15	025	00101001	NAK	53	0x35	065	01101001	5	85	0x55	125	10101001	U	117	0x75	165	11101001	u
22	0x16	026	00101010	SYN	54	0x36	066	01101010	6	86	0x56	126	10101010	V	118	0x76	166	11101010	v
23	0x17	027	00101011	ETB	55	0x37	067	01101011	7	87	0x57	127	10101011	W	119	0x77	167	11101011	w
24	0x18	030	00110000	CAN	56	0x38	070	01110000	8	88	0x58	130	10110000	X	120	0x78	170	11110000	x
25	0x19	031	00110001	EM	57	0x39	071	01110001	9	89	0x59	131	10110001	Y	121	0x79	171	11110001	y
26	0x1A	032	00110010	SUB	58	0x3A	072	01110010	:	90	0x5A	132	10110010	Z	122	0x7A	172	11110010	z
27	0x1B	033	00110011	ESC	59	0x3B	073	01110011	;	91	0x5B	133	10110011	[123	0x7B	173	11110011	{
28	0x1C	034	00111000	FS	60	0x3C	074	01111000	<	92	0x5C	134	10111000	\	124	0x7C	174	11111000	
29	0x1D	035	00111001	GS	61	0x3D	075	01111001	>	93	0x5D	135	10111001]	125	0x7D	175	11111001	}
30	0x1E	036	00111100	RS	62	0x3E	076	01111100	?	94	0x5E	136	10111100	^	126	0x7E	176	11111100	~
31	0x1F	037	00111101	US	63	0x3F	077	01111101	?	95	0x5F	137	10111101	_	127	0x7F	177	11111101	DEL

ASCII

A burst of
1001110 could equate to the alpha character N

Fieldbus Concept - Devices

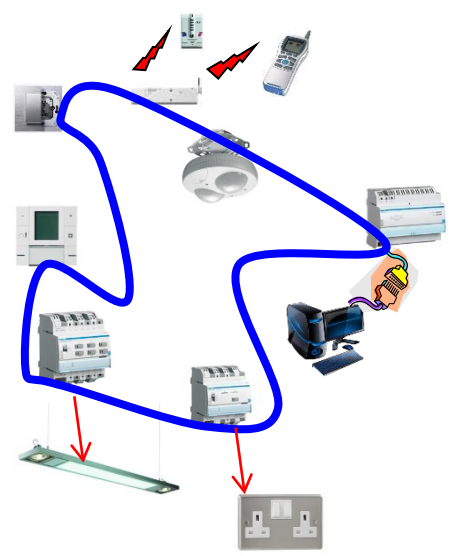
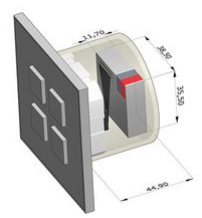
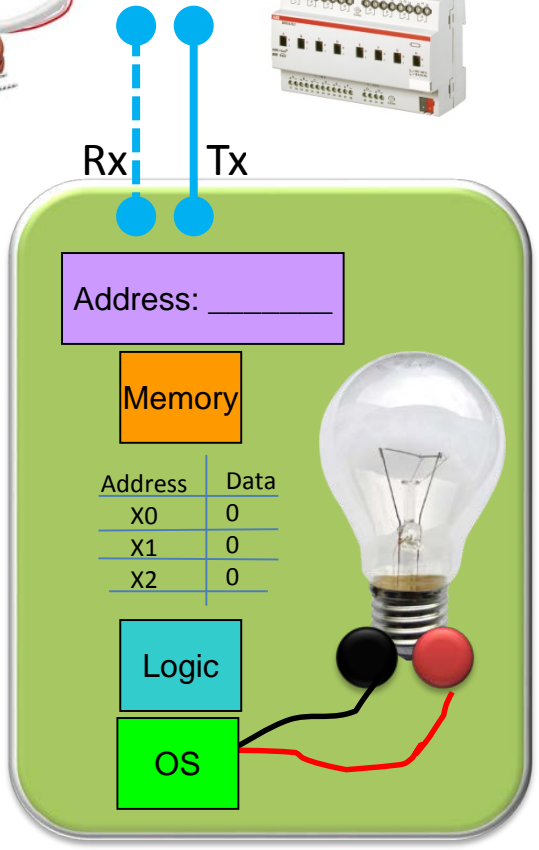
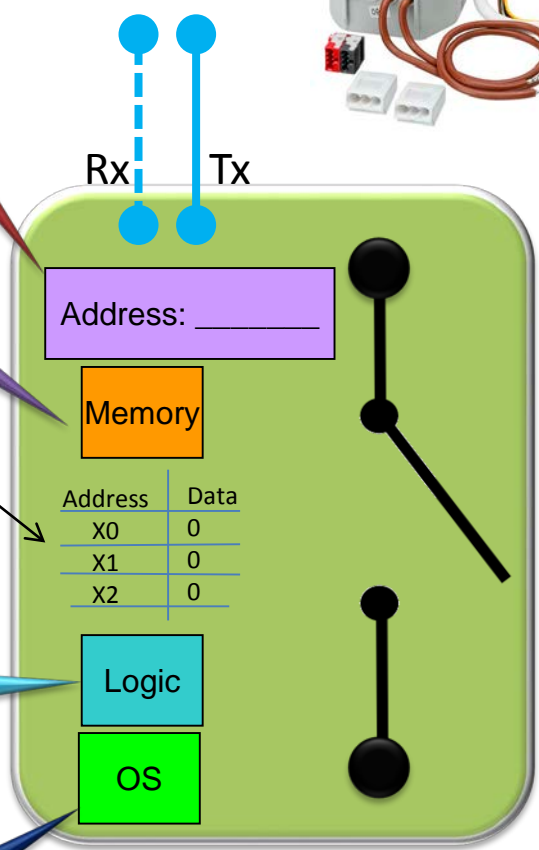


Unique Address

Memory

Logic

Operating System



To Device ; From Device

Move First, Move Next, Make 1

To Device ; From Device

iPOT

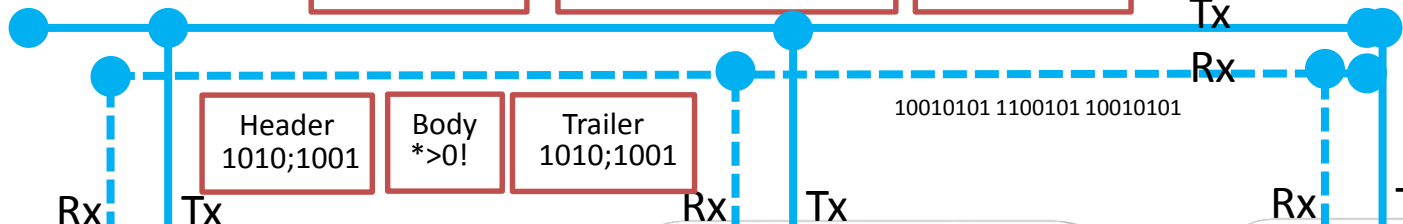
towards people oriented technology



Header 1010;1011

Body *>1!

Trailer 1010;1011



Warning
One cable and reuse

Header 1010;1001 Body *>0! Trailer 1010;1001

10010101 1100101 10010101

Address: 1010

Memory

Address	Data
X0	0
X1	0
X2	0

Logic

OS

Title: _____
Activity:: _____
Location:: _____



Address: 1001

Memory

Address	Data
X0	0
X1	0
X2	0

Logic

OS

Title: _____
Activity:: _____
Location:: _____



Address: 1011

Memory

Address	Data
X0	0
X1	0
X2	0

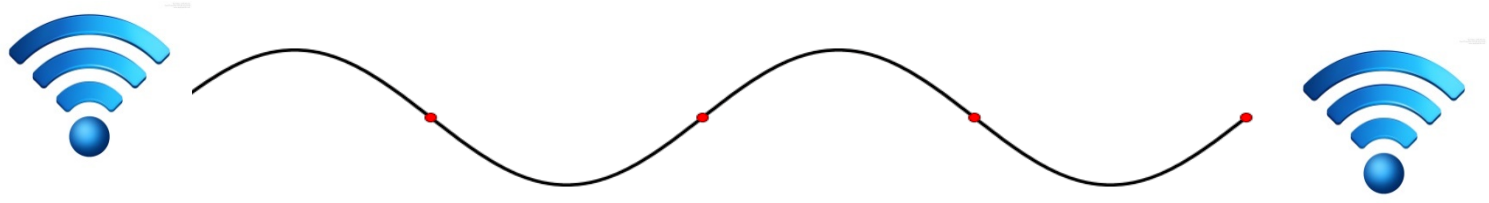
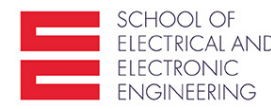
Logic

OS

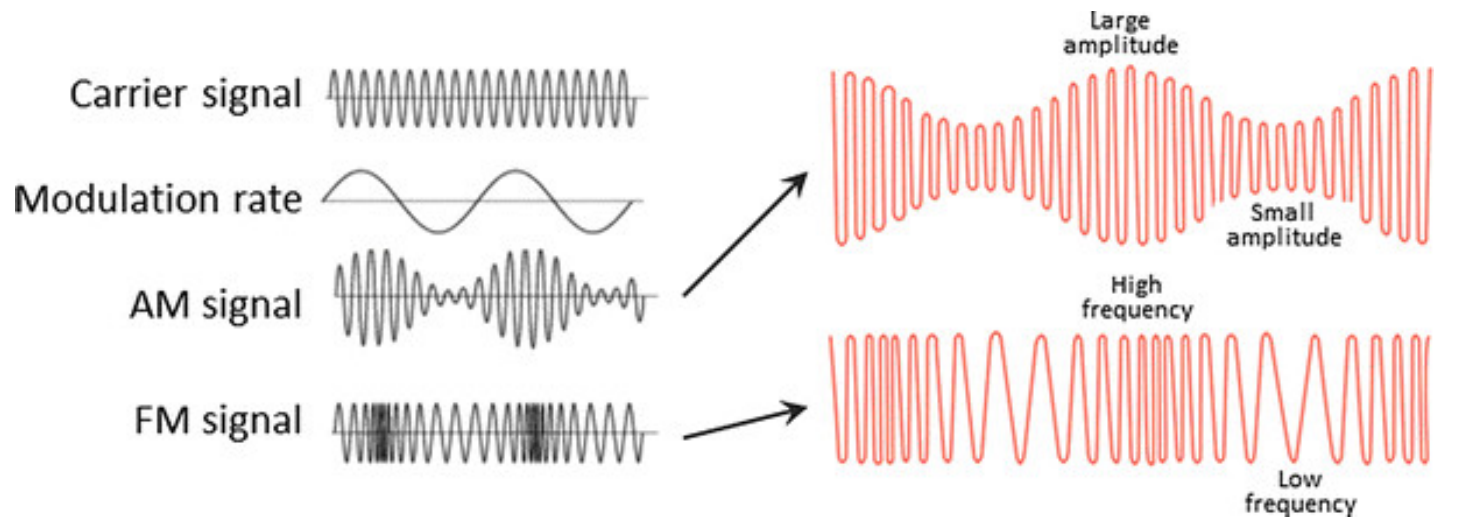
Title: _____
Activity:: _____
Location:: _____



Fieldbus Concept - Wireless



WIFI is frequency based - 2.4Ghz and 5Ghz



10010101 1100101 10010101

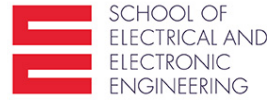
High,Low,Low,High,Low,High,Low,High

High or Low Frequency or Amplitude

To Device ; From Device

Move First, Move Next, Make 1

To Device ; From Device



Header
1010;1011

Body
*>1!

Trailer
1010;1011



Warning
Over air

Address: 1010

Memory

Address	Data
X0	0
X1	0
X2	0

Logic

OS

Title: _____

Activity:: _____

Location:: _____



Address: 1011

Memory

Address	Data
X0	0
X1	0
X2	0

Logic

OS

Title: _____

Activity:: _____

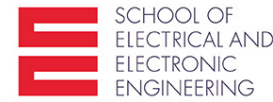
Location:: _____



To Device ; From Device

Move First, Move Next, Make 1

To Device ; From Device



Header
1010;1001

Body
*>1!

Trailer
1010;1001



Address: 1010

Memory

Address	Data
X0	0
X1	0
X2	0

Logic

OS

Title: _____

Activity:: _____

Location:: _____

Address: 1001

Memory

Address	Data
X0	0
X1	0
X2	0

Logic

OS

Second Switch

Title: _____

Activity:: _____

Location:: _____

Address: 1011

Memory

Address	Data
X0	0
X1	0
X2	0

Logic

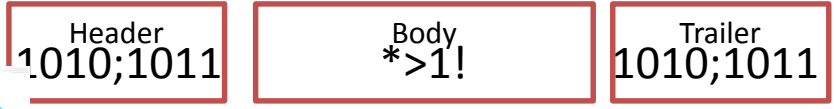
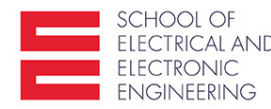
OS

Title: _____

Activity:: _____

Location:: _____

Fieldbus Concept - Wireless



Warning
Over air

Address: 1010

Memory

Address	Data
X0	0
X1	0
X2	0

Logic

OS

Title: _____

Activity:: _____

Location:: _____

Address: 1011

Memory

Address	Data
X0	0
X1	0
X2	0

Logic

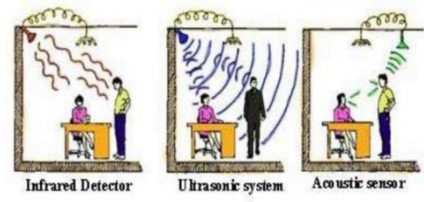
OS

Jane moved in bed

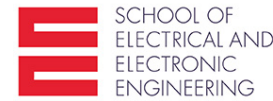
John stepped out of bed

James moved in a room

Motion Sensor (PIR)

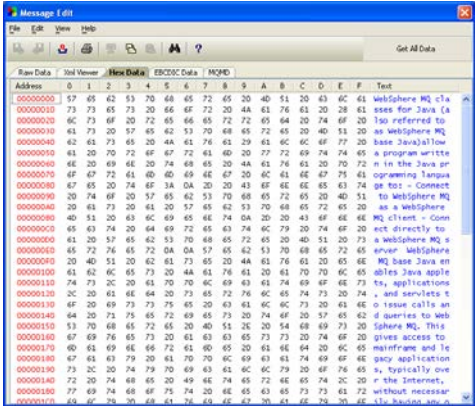


Fieldbus Concept - Messages



```
0000001010100000000000101000010100000010010001000100010010100101010101
0101010010010000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000
100001110001100011000100000000000000000000000000000000000000000000000000
100001101011110111101111011100000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000
000000000000100001100001100011000100000010000000000000000000000000000000
011010111101111011110111100000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000
001001010000000000001100111101001111000
```

Simple 1 or 0 messages



Hexadecimal messages
But still transmitted as 1 or 0

```
<?xml version="1.0" encoding="UTF-8"?>
- <Envelope xmlns="http://schemas.microsoft.com/dynamics/2011/01/documents/Message">
  - <Header>
    <Action http://schemas.microsoft.com/dynamics/2008/01/services/SalesOrderService/create/></Action>
  </Header>
  - <Body>
    - <MessageParts xmlns="http://schemas.microsoft.com/dynamics/2011/01/documents/Message">
      - <SalesOrder xmlns="http://schemas.microsoft.com/dynamics/2008/01/documents/SalesOrder">
        - <SalesTable class="entity">
          - <CustAccount>US-004</CustAccount>
          <DeliveryDate>2014-12-12</DeliveryDate>
          <PurchOrderFormNum>XML through AIF</PurchOrderFormNum>
          <ReceiptDateRequested>2013-12-16</ReceiptDateRequested>
        - <SalesLine class="entity">
          <ItemId>T0002</ItemId>
          <SalesQty>44.00</SalesQty>
          <SalesUnit>ea</SalesUnit>
        </SalesLine>
      </SalesTable>
    </SalesOrder>
  </MessageParts>
</Body>
</Envelope>
```

XML or JSON messages
But still transmitted as 1 or 0



ALERT

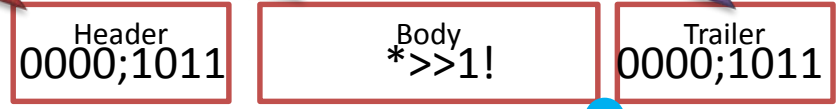
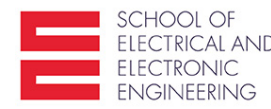
But this is only sending information.
How is it intelligent!!!

Logic Location

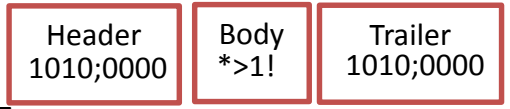
To Device ; From Device

Move First, Move Next, Move Next Make 1

To Device ; From Device



10010101 1100101 10010101



Rx Tx

Address: 1010

Memory

Address	Data
X0	0
X1	0
X2	0

Logic

OS

Title: _____

Activity:: _____

Location:: _____

Rx Tx

Address: 0000

Memory

Address	Data
X0	0
X1	0
X2	0

LARGE Logic

OS

Title: _____

Activity:: _____

Location:: _____

Rx Tx

Address: 1011

Memory

Address	Data
X0	0
X1	0
X2	0

Logic

OS

Title: _____

Activity:: _____

Location:: _____

Intelligence - Device

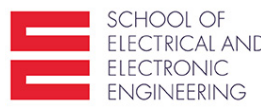


Bulletproof & Robust

Robust and Reliable?
Not an app on a phone or PC



Stable



Mobile users



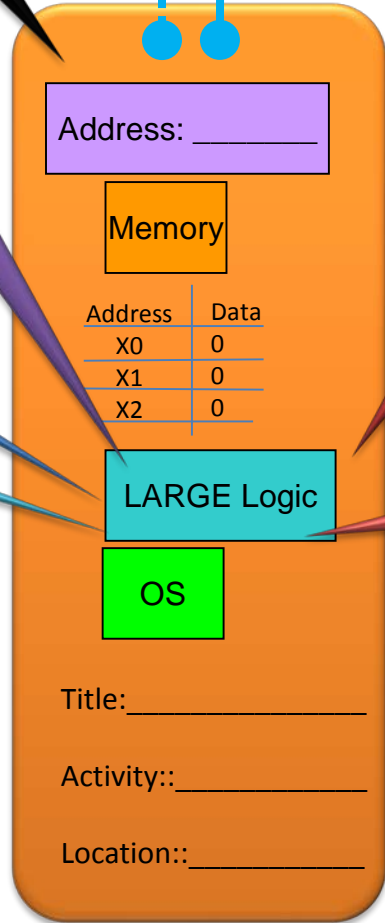
How is the logic expressed?

Where is it located?

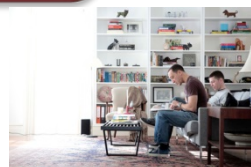
When is it used?

How do we capture different users?

How do we capture different situations?

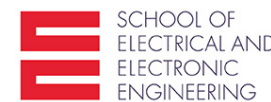


Warning
Every time a new device is added it needs to be included in the big logic



Can this be different?

In essence



One app does not exclusively own the screen function
Or battery, or vibration or calendar or alerts.
They reuse and share the functions through apps

Phone



In a similar way

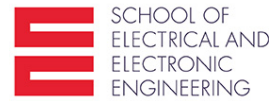
One user does not exclusively own the fridge function
Or TV, or shower or front door or alerts.
They reuse and share the functions through intelligent ubiquitous interaction

Building



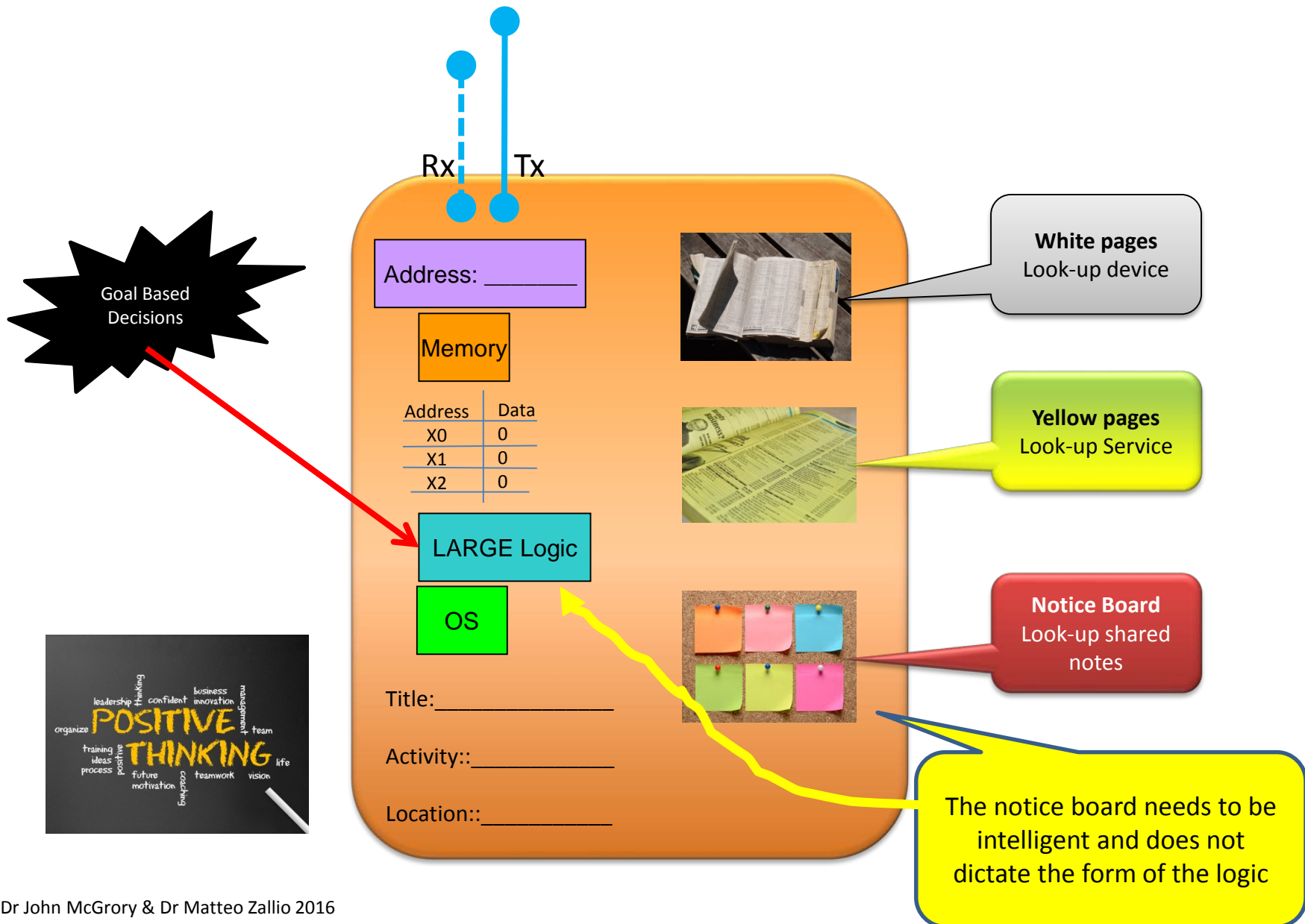
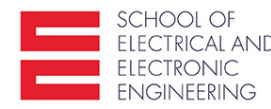


Collaboration Concept



Item	Collaborating-software challenges
1	Representation – getting software modules to understand one another
2	Awareness – making modules aware when something relevant to them occurs.
3	Investigation – helping modules to quickly find information relating to their current activities.
4	Interaction – creating modules that are able to use the concurrent work of others while working on a shared task.
5	Integration – combining results produced by other modules.
6	Coordination – getting modules to focus their activities on the right things at the right time.

Intelligence “On the Fly” Collaboration



White pages
Look-up device

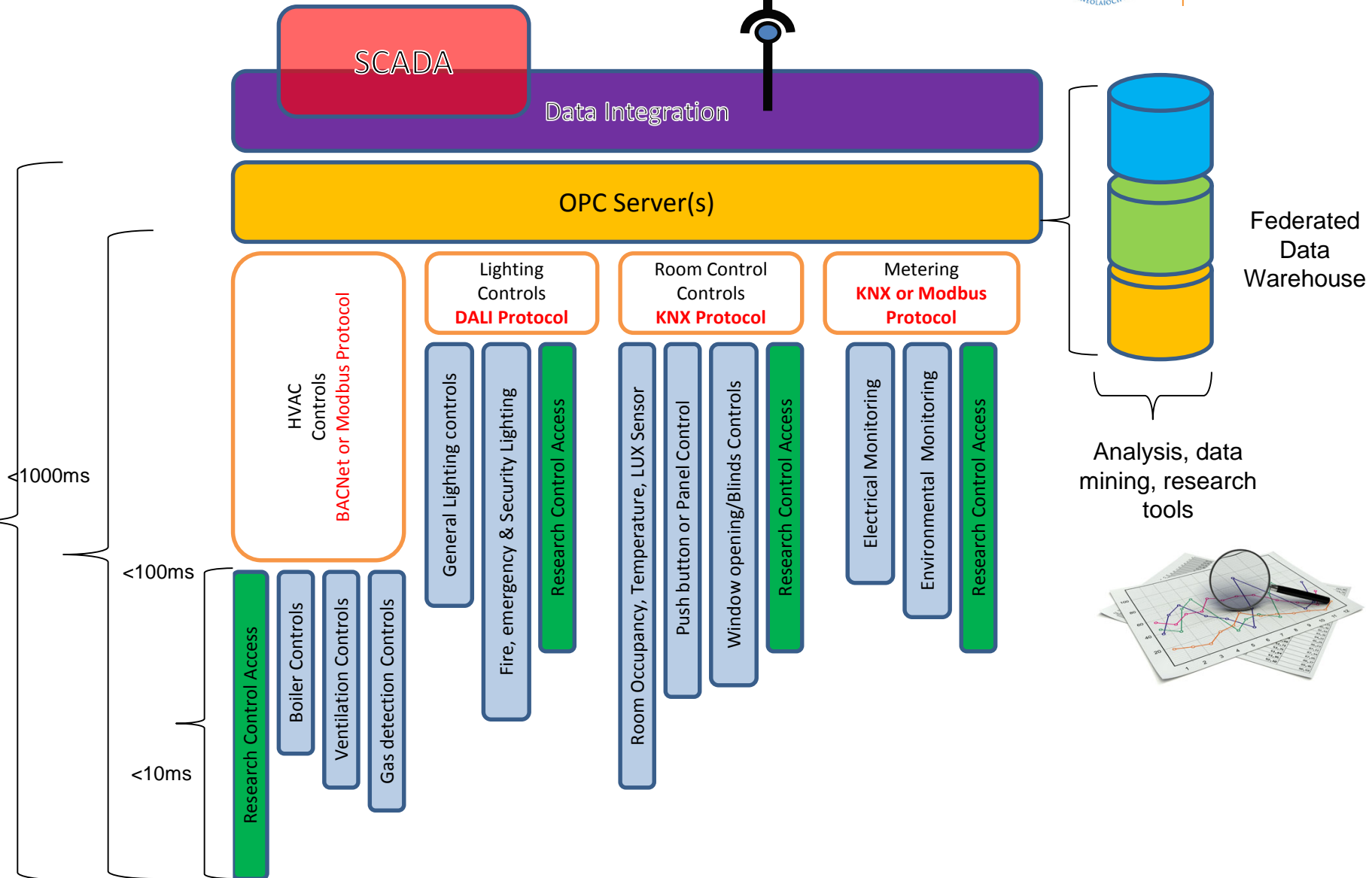
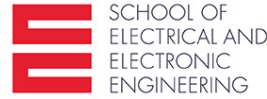
Yellow pages
Look-up Service

Notice Board
Look-up shared notes

The notice board needs to be intelligent and does not dictate the form of the logic

Topology of Protocols

Interface to other services



Switch



Title: _____

Activity:: _____

Location:: _____

Light Bulb



Title: _____

Activity:: _____

Location:: _____

Varying Resistance



Title: _____

Activity:: _____

Location:: _____

Motor



Title: _____

Activity:: _____

Location:: _____



Light Bulb

Title: _____

Activity:: _____

Location:: _____

Radiator Valve




Title: _____

Activity:: _____

Location:: _____

Fan




Title: _____

Activity:: _____

Location:: _____

Light Bulb




Title: _____

Activity:: _____

Location:: _____


Varying Resistance



Title: _____

Activity:: _____

Location:: _____




Title: _____

Activity:: _____

Location:: _____

Light Bulb




Title: _____

Activity:: _____

Location:: _____

Radiator Valve



Title: _____

Activity:: _____

Location:: _____

