Conference papers   School of Electrical and Electronic Engineering

Environment Design to Sustain Users - Workshop 23

John McGrory
Technological University Dublin, john.mcgrory@tudublin.ie

Matteo Zallio
Technological University Dublin, matteo.zallio@tudublin.ie

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Workshop 23
Environment Design to Sustain Users

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Dr John McGrory
Dublin Institute of Technology

Dr Matteo Zallio
Dublin Institute of Technology

Ecosystem - People

Road terrain & other vehicles/people

Home

Utility Company

Car

Utility Company

Work

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
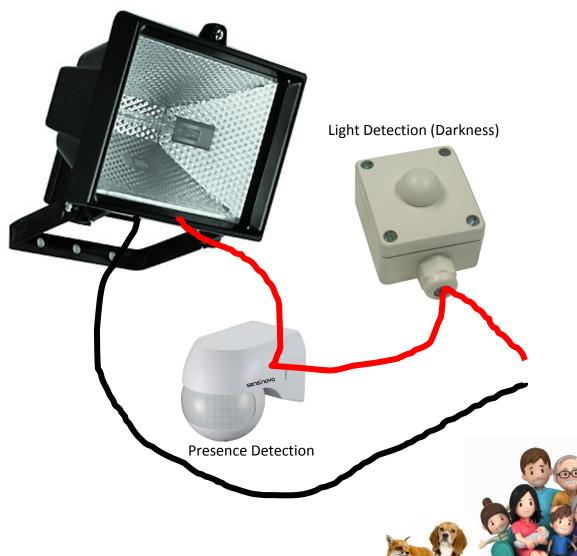
System Patterns - Example

Flood Light Fitting

Light Detection (Darkness)

Industrial Integrated Solution

Presence Detection

System Patterns - Example

Now
Individual key
Adjust seat
Adjust control sensitivity

These common patterns have weightings and context for individuals

Offer customised personalised experience
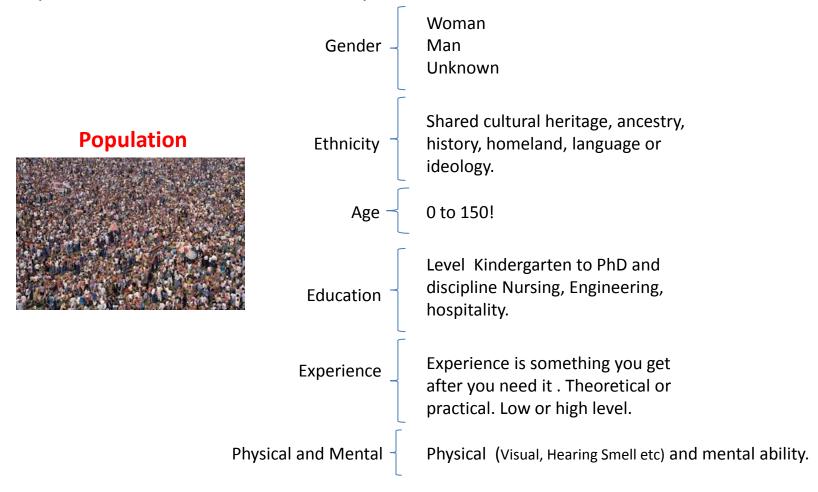
Ecosystem Deviation Population

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

Population

Factor	Description
Gender	Woman Man Unknown
Ethnicity	Shared cultural heritage, ancestry, history, homeland, language or ideology.
Age	0 to 150!
Education	Level Kindergarten to PhD and discipline Nursing, Engineering, hospitality.
Experience	Experience is something you get after you need it . Theoretical or practical. Low or high level.
Physical and Mental	Physical (Visual, Hearing Smell etc) and mental ability.

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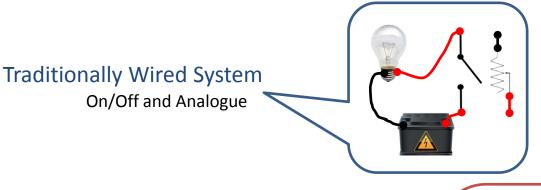
But we will show you today some tricks and knowledge you need to employ, so YOU….yes….YOU can be better prepared.

Discussion of Systems

Traditionally Wired System
On/Off and Analogue

Fieldbus Wired System

Intelligent Wired System
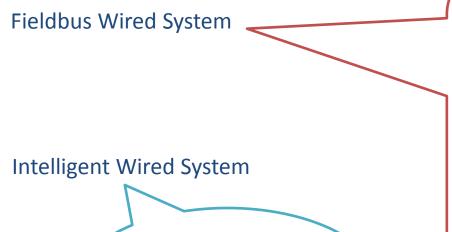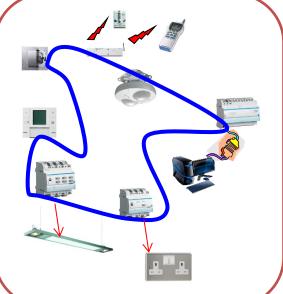
Warning
Simplistic View
To show issues and concepts

Traditionally Wired System – On/Off

Title:_____ LG_1

Activity::_____ Lights

Location::_____ Room 1a

it's like magic

Supply

Title:_____ SW_1

Activity::_____ Lights

Location::_____ Room 1a
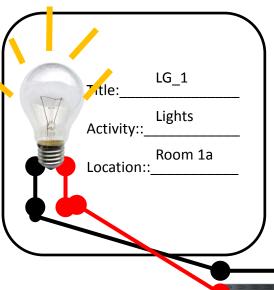
Steps:
1. Place the components switch and light
2. Place the wiring
3. Label the system.

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

tPOT — towards people oriented technology

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push to make

push to break

single pole
single way or throw

single pole
two way or throw

double pole
single way or throw

Passive infrared-motion sensor block diagram

Fresnel lens

+V

PIR

Amplifier Comparator

Output

Thermal energy

Pyroelectric sensor

IR filter

Quorum

On/Off **Actuator** Concept

Doors, Gates, Fans

Blinds

User in Traditionally Wired

Title:_____

Activity::_____

Location::_____

Supply

Jane moved in bed

John stepped out of bed

Motion Sensor (PIR)

James moved in a room

Infrared Detector   Ultrasonic system   Acoustic sensor
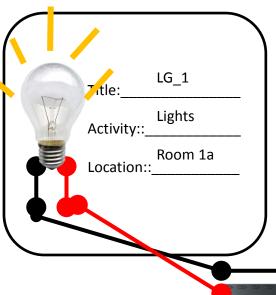
Traditionally Wired System -Analogue

Title:_____ LG_1

Activity::_____ Lights

Location::_____ Room 1a

it's like magic

Varying Resistance

Title:_____ Dim_SW_1

Activity::_____ Lights

Location::_____ Room 1a
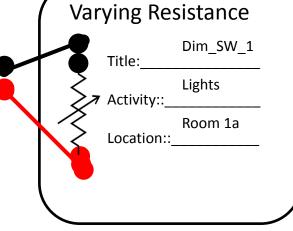
Supply

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
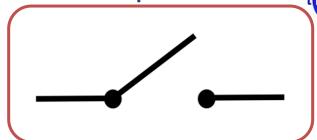But
Reuse/ multiuse of signal?
Individual preferences
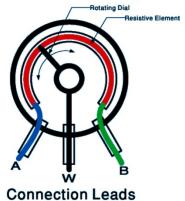
Analogue Sensor Concept - Examples

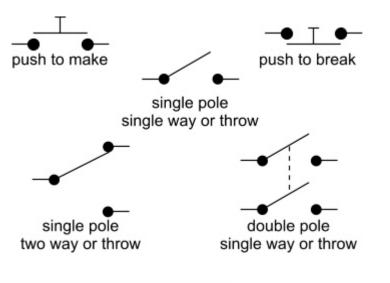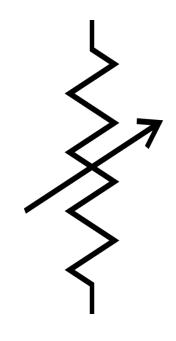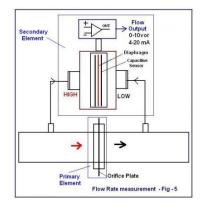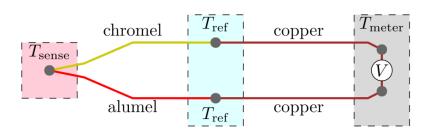**Warning**
Could vary Voltage,
Resistance or Current to
do the same thing

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Analogue Actuator Concept -Examples
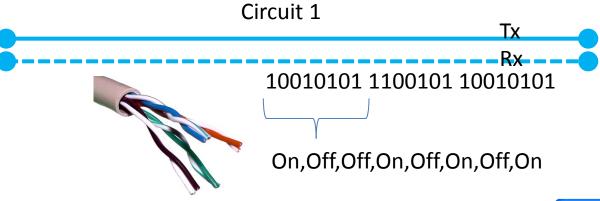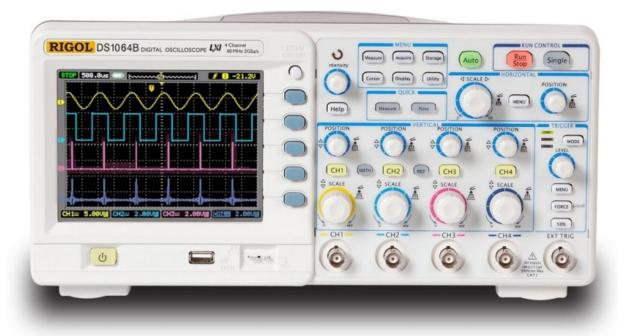
Fieldbus Concept - Simplified
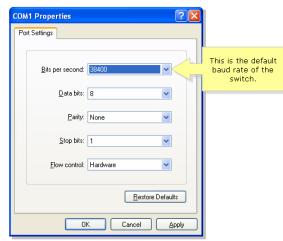
Circuit 1

Tx

Rx

10010101 1100101 10010101

On,Off,Off,On,Off,On,Off,On

This is the default baud rate of the switch.

COM1 Properties

Port Settings

Bits per second: 38400

Data bits: 8

Parity: None

Stop bits: 1

Flow control: Hardware

Restore Defaults

OK   Cancel   Apply

Fieldbus Concept - Simplified
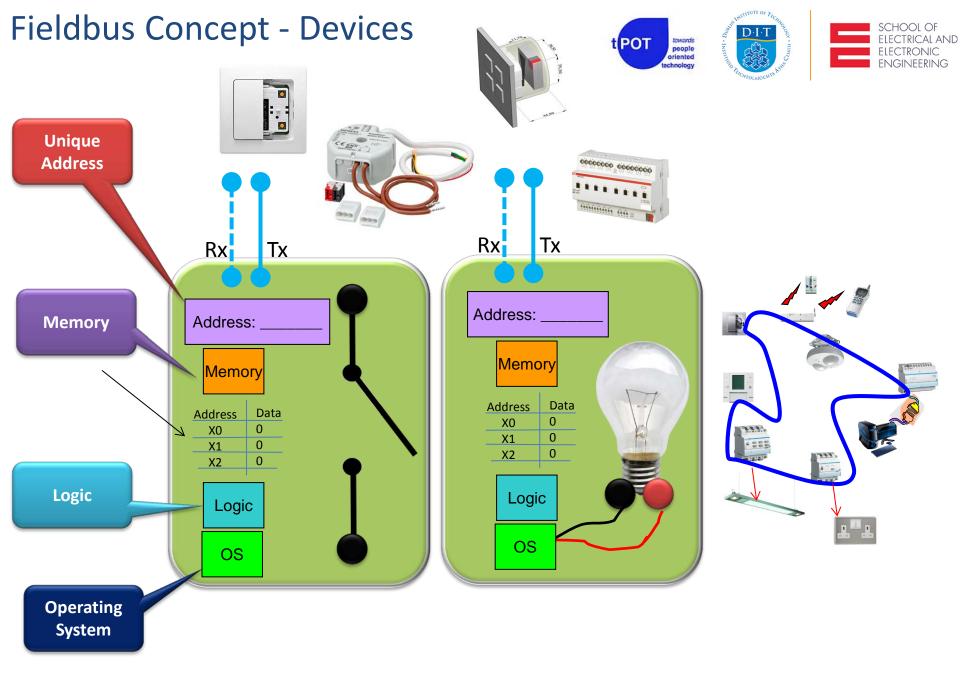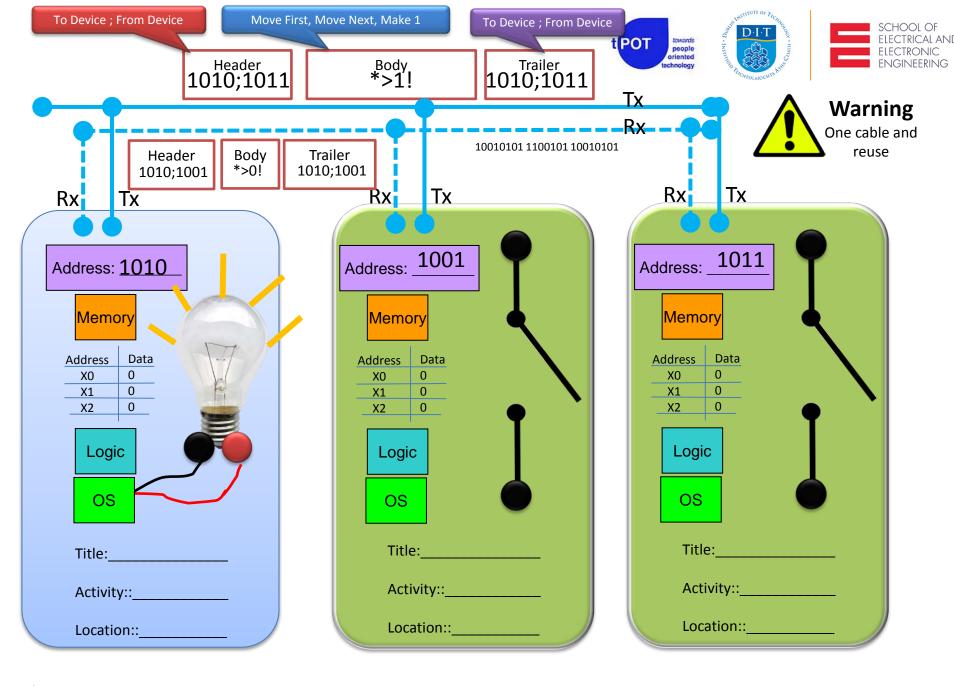
Dec	Hex	Oct	Bin	Char	Dec	Hex	Oct	Bin	Char	Dec	Hex	Oct	Bin	Char	Dec	Hex	Oct	Bin	Char
0	0x00	000	0000000	NUL	32	0x20	040	0100000	space	64	0x40	100	1000000	@	96	0x60	140	1100000	`
1	0x01	001	0000001	SOH	33	0x21	041	0100001	!	65	0x41	101	1000001	A	97	0x61	141	1100001	a
2	0x02	002	0000010	STX	34	0x22	042	0100010	"	66	0x42	102	1000010	B	98	0x62	142	1100010	b
3	0x03	003	0000011	ETX	35	0x23	043	0100011	#	67	0x43	103	1000011	C	99	0x63	143	1100011	c
4	0x04	004	0000100	EOT	36	0x24	044	0100100	$	68	0x44	104	1000100	D	100	0x64	144	1100100	d
5	0x05	005	0000101	ENQ	37	0x25	045	0100101	%	69	0x45	105	1000101	E	101	0x65	145	1100101	e
6	0x06	006	0000110	ACK	38	0x26	046	0100110	&	70	0x46	106	1000110	F	102	0x66	146	1100110	f
7	0x07	007	0000111	BEL	39	0x27	047	0100111	'	71	0x47	107	1000111	G	103	0x67	147	1100111	g
8	0x08	010	0001000	BS	40	0x28	050	0101000	(	72	0x48	110	1001000	H	104	0x68	150	1101000	h
9	0x09	011	0001001	TAB	41	0x29	051	0101001	)	73	0x49	111	1001001	I	105	0x69	151	1101001	i
10	0x0A	012	0001010	LF	42	0x2A	052	0101010	*	74	0x4A	112	1001010	J	106	0x6A	152	1101010	j
11	0x0B	013	0001011	VT	43	0x2B	053	0101011	+	75	0x4B	113	1001011	K	107	0x6B	153	1101011	k
12	0x0C	014	0001100	FF	44	0x2C	054	0101100	,	76	0x4C	114	1001100	L	108	0x6C	154	1101100	l
13	0x0D	015	0001101	CR	45	0x2D	055	0101101	-	77	0x4D	115	1001101	M	109	0x6D	155	1101101	m
14	0x0E	016	0001110	SO	46	0x2E	056	0101110	.	78	0x4E	116	1001110	N	110	0x6E	156	1101110	n
15	0x0F	017	0001111	SI	47	0x2F	057	0101111	/	79	0x4F	117	1001111	O	111	0x6F	157	1101111	o
16	0x10	020	0010000	DLE	48	0x30	060	0110000	0	80	0x50	120	1010000	P	112	0x70	160	1110000	p
17	0x11	021	0010001	DC1	49	0x31	061	0110001	1	81	0x51	121	1010001	Q	113	0x71	161	1110001	q
18	0x12	022	0010010	DC2	50	0x32	062	0110010	2	82	0x52	122	1010010	R	114	0x72	162	1110010	r
19	0x13	023	0010011	DC3	51	0x33	063	0110011	3	83	0x53	123	1010011	S	115	0x73	163	1110011	s
20	0x14	024	0010100	DC4	52	0x34	064	0110100	4	84	0x54	124	1010100	T	116	0x74	164	1110100	t
21	0x15	025	0010101	NAK	53	0x35	065	0110101	5	85	0x55	125	1010101	U	117	0x75	165	1110101	u
22	0x16	026	0010110	SYN	54	0x36	066	0110110	6	86	0x56	126	1010110	V	118	0x76	166	1110110	v
23	0x17	027	0010111	ETB	55	0x37	067	0110111	7	87	0x57	127	1010111	W	119	0x77	167	1110111	w
24	0x18	030	0011000	CAN	56	0x38	070	0111000	8	88	0x58	130	1011000	X	120	0x78	170	1111000	x
25	0x19	031	0011001	EM	57	0x39	071	0111001	9	89	0x59	131	1011001	Y	121	0x79	171	1111001	y
26	0x1A	032	0011010	SUB	58	0x3A	072	0111010	:	90	0x5A	132	1011010	Z	122	0x7A	172	1111010	z
27	0x1B	033	0011011	ESC	59	0x3B	073	0111011	;	91	0x5B	133	1011011	[	123	0x7B	173	1111011	{
28	0x1C	034	0011100	FS	60	0x3C	074	0111100	<	92	0x5C	134	1011100	\	124	0x7C	174	1111100		
29	0x1D	035	0011101	GS	61	0x3D	075	0111101	=	93	0x5D	135	1011101	]	125	0x7D	175	1111101	}
30	0x1E	036	0011110	RS	62	0x3E	076	0111110	>	94	0x5E	136	1011110	^	126	0x7E	176	1111110	~
31	0x1F	037	0011111	US	63	0x3F	077	0111111	?	95	0x5F	137	1011111	_	127	0x7F	177	1111111	DEL

A burst of
1001110 could equate to the alpha character N

Fieldbus Concept - Devices

Unique Address

Memory

Logic

Operating System

Rx   Tx   Rx   Tx

Address: _____

Memory

Address	Data
X0	0
X1	0
X2	0

Logic

OS

Address: _____

Memory

Address	Data
X0	0
X1	0
X2	0

Logic

OS

tPOT — towards people oriented technology

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Fieldbus Concept - Wireless

WIFI is frequency based - 2.4Ghz and 5Ghz

Carrier signal

Modulation rate

AM signal

FM signal

Large amplitude

Small amplitude

High frequency

Low frequency

High or Low Frequency or Amplitude

10010101 1100101 10010101

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

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Fieldbus Concept - Wireless
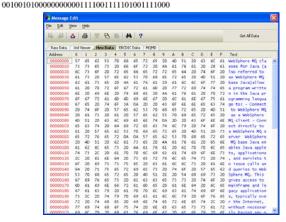
Header	Body	Trailer
1010;1011	*>1!	1010;1011

Warning
Over air

Address: __1010__

Memory

Address	Data
X0	0
X1	0
X2	0

Logic

OS

Title:_____

Activity::_____

Location::_____

Jane moved in bed

Address: __1011__

Memory

Address	Data
X0	0
X1	0
X2	0

Logic

OS

John stepped out of bed

Motion Sensor (PIR)

Infrared Detector   Ultrasonic system   Acoustic sensor

James moved in a room

Fieldbus Concept - Messages

000000010101010000000000000010100000010100000001001000100010001001011001010101010
010101001001000000000000000000000000000000000001100000000000000000011010000
000000000000000011010000000000000000001010100000000000000000001111100000000000
000000000000000000001100001110001100001000100000000000001100100001101000110001
100001101011110110111110111101111000000000000000000000001000000000000000000001
0000000000000000000000000001000000000000000000111111000000000000000011111000000000
000000000000000010000000001000000000100000100000001100000001100001000000011
00000000110001000011000000000000000010011001100000000100011000001100000000110
00011000001000000001000000100000010000001000000011000000001000000000001110000
0000100010010000010000010000010000010000010000010000010000010000010000000011000
0011000001100000010001110101100000010011100100111111101110000111000001110
11100000000010100000011101101000000010100000011111001000000101000001100000
01000111000000000000000000000000000000001110000010000000000000111011010000101
010101010011100000000010101010000000000000010100000000000001111100000000000
0000011111111101000000000000011000000011100000000110000000001000000000001010000
00000101100000011001100000000110011000100001010000010100010000100100010001001000
100000001000101000100000000000010000100001000000000000010000000001000000000000
001001001000000001111001111010100111100

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>
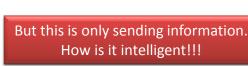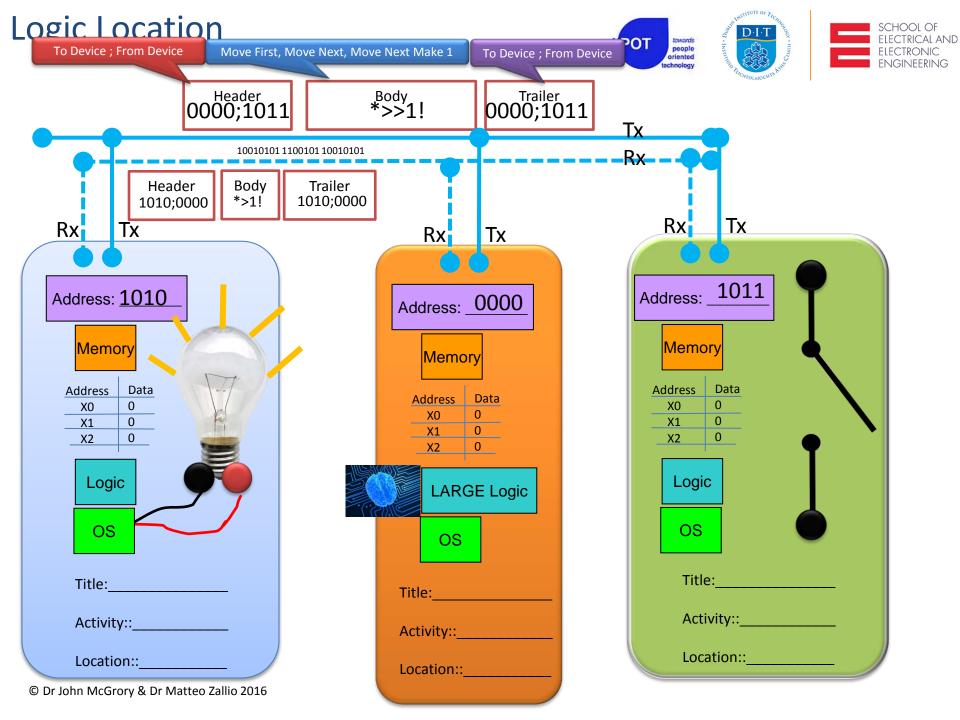   <Action>http://schemas.microsoft.com/dynamics/2008/01/services/SalesOrderService/create</Action>
    </Header>
  - <Body>
    - <MessageParts xmlns="http://schemas.microsoft.com/dynamics/2011/01/documents/Message">
      - <SalesOrder xmlns="http://schemas.microsoft.com/dynamics/2008/01/documents/SalesOrder">
        - <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>
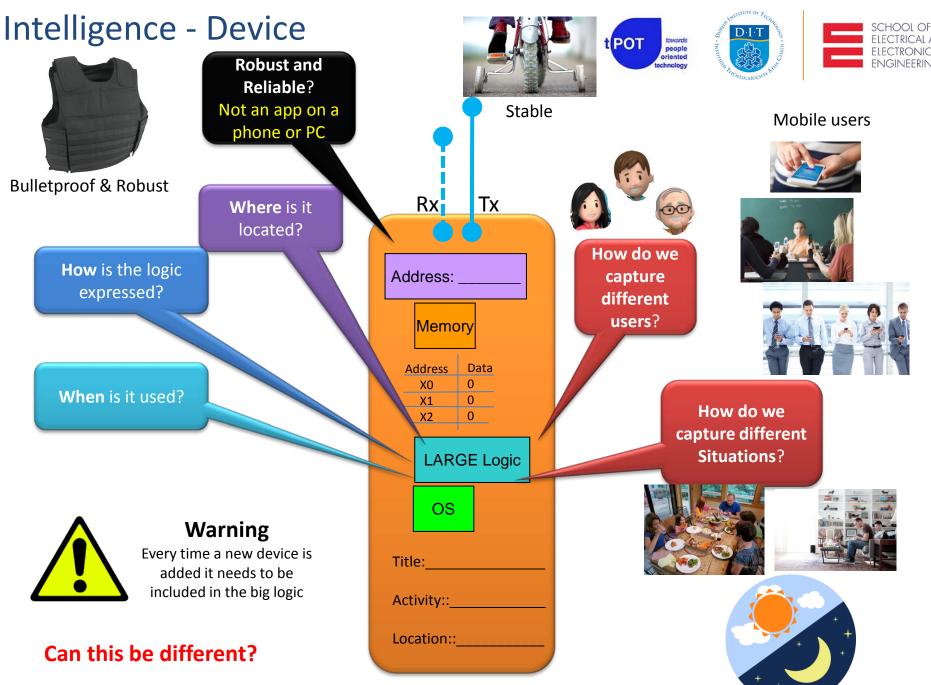
XML or JSON messages
But still transmitted as 1 or 0

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

ALERT

Logic Location

To Device ; From Device

Move First, Move Next, Move Next Make 1

To Device ; From Device

Header	Body	Trailer
0000;1011	*>>1!	0000;1011

Tx

10010101 1100101 10010101

Rx

Header	Body	Trailer
1010;0000	*>1!	1010;0000

Rx   Tx

Rx   Tx

Rx   Tx

Address: 1010

Memory

Address	Data
X0	0
X1	0
X2	0

Logic

OS

Title:_____

Activity::_____

Location::_____

Address: 0000

Memory

Address	Data
X0	0
X1	0
X2	0

LARGE Logic

OS

Title:_____

Activity::_____

Location::_____

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

Where is it located?

How is the logic expressed?

When is it used?

Rx   Tx

Address: _____

Memory

Address	Data
X0	0
X1	0
X2	0

LARGE Logic

OS

Title:_____

Activity::_____

Location::_____

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

Exclusive ownership

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