

Notice Inviting Quotation

DeitY/Purc/NIQ/2015/1

Date: 14.03.2017

Sealed quotations are invited to setup a Smart Lighting (IoT) testbed at NEHU campus, Shillong. The testbed shall provision the use of technologies like 6LoWPAN, Wi-Fi, Bluetooth, RFID, LoRa, SigFox etc. An overview of the testbed with the support of Wi-Fi and 6LoWPAN technologies is shown in Figure 1. The required resources for the testbed are listed out in Annexure I. Some additional resources are also mentioned in the annexure as redundant components or for advanced experimentation purpose.

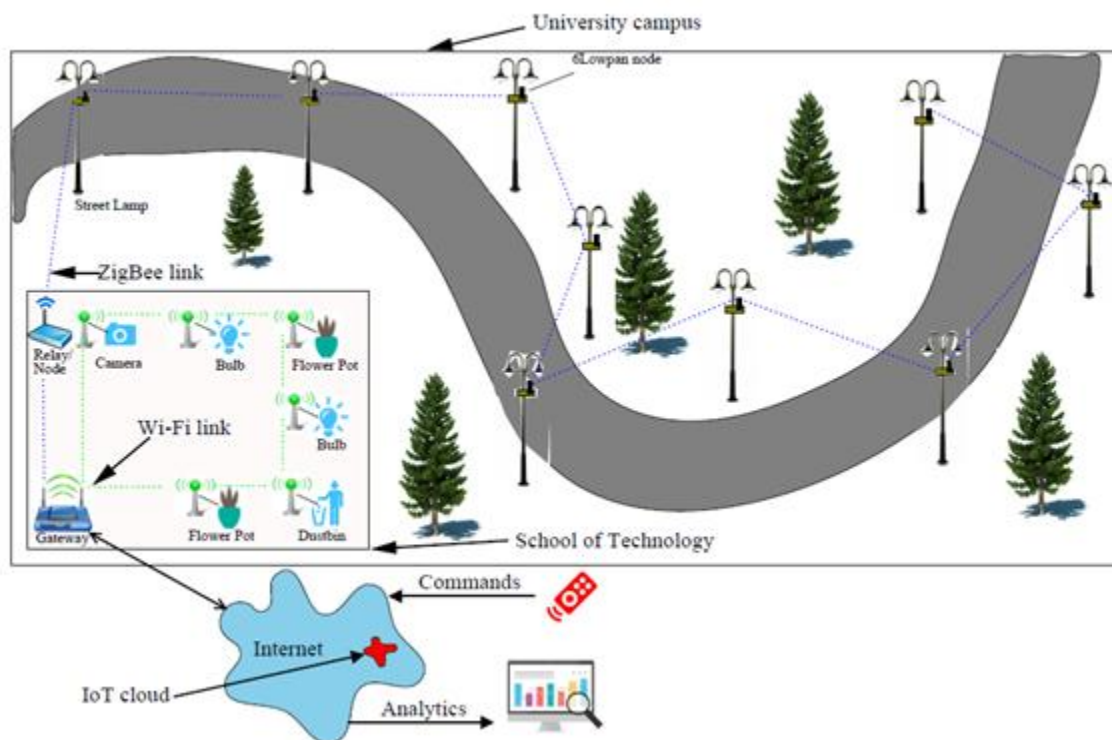


Figure 1. An overview of the Smart Lighting testbed to be setup

Annexure- I

Sl. No.	Item		Quantity	Minimum Specifications
1	Server		1	1.1. Processor - Octa core, 3 GHz, 64 Bit, 8 MB cache 1.2. RAM - 10 GB 1.3. Hard disk - 2 TB 1.4. OS - Linux
2	Gateway	2.1. For Short range (30m)	4	2.1.1. Processor - Quad core, 1.2 GHz, 64 Bit 2.1.2. Memory - 1GB RAM, 8 GB ROM 2.1.3. OS - Open source Linux 2.1.4. Operating frequency - 2.4 GHz or Sub-1 GHz 2.1.5. Network Interface support - Ethernet, Wi-Fi, ZigBee, Bluetooth, and BLE 2.1.6. Protocol support - 6LBR, 6LoWPAN, HTTP, RPL, MQTT, and COAP
		2.2. Long Range(1km)	2	2.2.1. Processor - Quad core, 1.2 GHz, 64 Bit 2.2.2. Memory - 1GB RAM, 8 GB ROM 2.2.3. OS - Open source Linux 2.2.4. Operating frequency - Sub-1 GHz 2.2.5. NetworkInterface support - 4G ,3G , GPS, LoRa , SigFox
3		3.1. High-end	50	3.1.1. RAM - 32 kB 3.1.2. Flash - 512 kB 3.1.3. Operating frequency - Sub-1 GHz 3.1.4. Power supply through USB and battery 3.1.5. Programmable with debugger or without debugger 3.1.6. Processor - ARM-cortex M3 based MCU 3.1.7. On-board ADC resolution : 12 bit 8 Channel ADC 3.1.8. Protocols - 6LoWPAN stack with COAP, MQTT and mesh routing (e.g., RPL) 3.1.9. OS - Open source operating systems (e.g., Contiki) 3.1.10. Sensor/Actuator - Programmable for sensing and actuating 3.1.11. GPIOs - Minimum 5 for sensor and 5 for actuators

	6LoWPAN node	3.2. Low-end	200	<p>3.2.1. RAM- 16 kB</p> <p>3.2.2. Flash- 128 kB</p> <p>3.2.3. Power supply through battery</p> <p>3.2.4. Programmable with debugger or without debugger</p> <p>3.2.5. Processor- ARM-cortex M3 based MCU</p> <p>3.2.6. On-board ADC resolution: 12 bit 8 Channel ADC</p> <p>3.2.7. Operating frequency- 2.4 GHz</p> <p>3.2.8. Protocols- 6LoWPAN stack with COAP, MQTT and mesh routing (e.g., RPL)</p> <p>3.2.9. OS- Open source operating systems (e.g., Contiki)</p> <p>3.2.10. Sensor/Actuator- Programmable for sensing and actuating</p> <p>3.2.11. GPIOs- Minimum 3 for sensors and 1 for actuator</p>
4	Wi-Fi node	4.1. 802.11a/b/g/n/ac	50	<p>4.1.1. RAM- 32KB</p> <p>4.1.2. Flash- 512 KB</p> <p>4.1.3. Processor- 32 Bit ARM MCU</p> <p>4.1.4. Operating frequency- 2.4/5 GHz</p> <p>4.1.5. GPIOs- Minimum 5 for sensors and 3 for actuators</p> <p>4.1.6. Device driver- Open source</p> <p>4.1.7. Sensor/Actuator- Programmable for sensing and actuating</p>
		4.2. IEEE 802.11ah	5	<p>4.1.1. RAM- 32KB</p> <p>4.1.2. Flash- 512 KB</p> <p>4.1.3. Processor- 32/64 Bit ARM MCU</p> <p>4.1.4. Operating frequency- Sub-1 GHz</p> <p>4.1.5. GPIOs- Minimum 5 for sensors and 3 for actuators</p> <p>4.1.6. Device driver- Open source</p> <p>4.1.7. Sensor/Actuator- Programmable for sensing and actuating</p>
5	RFID	5.1. Reader	15	<p>5.1.1. Current- 13mA</p> <p>5.1.2. Working voltage: 3.3V</p> <p>5.1.3. Operating Frequency: 13.56MHz</p> <p>5.1.4. Should be programmable with Wi-Fi nodes</p>
		5.2. Writer	5	<p>5.2.1. Current- 13mA</p> <p>5.2.2. Working voltage: 3.3V</p> <p>5.2.3. Operating Frequency: 13.56MHz</p>

			5.2.4. Should be programmable with Wi-Fi nodes
		5.3. Tag	200
			5.3.1. Operating Frequency: 13.56MHz
6	LoRa	3	6.1. Operating frequency- Sub-1 GHz 6.2. GPIOs- Minimum 3 for sensors and 3 for actuators 6.3. RAM- 8KB 6.4. Flash- 128 KB 6.5. Device driver- Open source 6.6. Sensor/Actuator- Programmable for sensing and actuating
7	SigFox	3	7.1. Operating frequency- Sub-1 GHz 7.2. GPIOs- Minimum 3 for sensor and 3 for actuators 7.3. RAM- 8 KB 7.4. Flash- 128 KB 7.5. Device driver- Open source 7.6. Sensor/Actuator- Programmable for sensing and actuating
8	Daylight sensor	150	8.1. Working voltage- 3.3/5V 8.2. Compatible with Wi-Fi and 6LoWPAN nodes
9	Motion sensor	150	9.1. Working voltage- 3.3/5V 9.2. Working temperature- up to 50°C 9.3. Compatible with Wi-Fi and 6LoWPAN nodes
10	Camera	50	10.1. Pixel- PIXEL 10.2. Resolution- 5 MP 10.3. Dimension- 640x480 10.4. Compatible with Wi-Fi and 6LoWPAN nodes 10.5. Support with ARM based MCU
11	Soil moisture sensor	20	11.1. Operating voltage- 3.3/5V 11.2. Compatible with Wi-Fi and 6LoWPAN nodes
12	Proximity sensor	50	12.1. Operating Voltage – 3.3/5V 12.2. Compatible with Wi-Fi and 6LoWPAN nodes
13	Humidity Sensor	50	13.1. Operating Voltage – 3.3/5V 13.2. Compatible with Wi-Fi and 6LoWPAN nodes
14	Temperature Sensor	50	14.1. Operating Voltage – 3.3/5V 14.2. Compatible with Wi-Fi and 6LoWPAN nodes
15	Pressure Sensor	20	15.1. Operating Voltage – 3.3/5V

			15.2. Compatible with Wi-Fi and 6LoWPAN nodes
16	Wind Sensor (Speed and Direction)	2	16.1. Operating Voltage – 3.3/5V 16.2. Compatible with Wi-Fi and 6LoWPAN nodes
17	Rainfall Sensor	10	17.1. Operating Voltage – 3.3/5V 17.2. Compatible with Wi-Fi and 6LoWPAN nodes
18	Street LED bulb	50	18.1. Operating Voltage - 200 V 18.2. Brightness - 3000 lm 18.3. Operating Wattage - 15 W 18.4. Outdoor setup with Water Proof features 18.5 Working Life - up to 30000hrs 18.6 Good heat dissipation
19	Street Lamp post	50	19.1. Height - 2m 19.2. High Quality 19.3 For supporting street LED bulb
20	Normal LED bulb	50	20.1. Operating Wattage - 7 W 20.2. Operating Voltage - 220 V 20.3. Brightness - 1000lm 20.4. Color Temperature : 6500K 20.5. Power and Plug should be AC 20.6. Cap type - B22
21	Channel relay	200	21.1. Type - 1 channel relay 21.2. Signal - High current 7A 21.3. Working voltage - 5V /3.3V 21.4. Compatible with AC and DC appliances 21.5. To switch ON/OFF the actuators
22	Smart Phone	2	22.1. RAM -4GB 22.2. ROM -64GB 22.3. Processor –Octa core, 64 bit, 1.5 GHz 22.4. OS - Android 5.5 and above 22.5. To be used as a remote device
23	Tablet PC	1	22.1. RAM -4GB 22.2. ROM –32GB 22.3. Processor –Octa core, 64 bit, 1.5 GHz 22.4. OS - Android 5.5 and above 22.5. To be used as a remote device
24	ISP JTAG cable	200	24.1. Type - 10-Pin, 1.27mm Pitch, IDC socket, Flat Ribbon

25	Micro SD Card	10	25.1. Capacity- 16GB
26	Pen drive	4	26.1. Capacity- 64 GB 26.2. Interface- USB 3.0
27	USB ttl	10	27.1. Interface- USB 2.0 27.2. Operating Voltage – 3.3/5V
28	Installation of Testbed	50 street lights	28.1. Powering and wiring of LED bulb for street lights 28.2. Relay Components

Annexure- II

Sl. No.	Item	Minimum Specification	Compatibility (Yes/No)	
1	Server	1.1. Processor - Octa core, 3 GHz, 64 Bit, 8 MB cache		
		1.2. RAM - 10 GB		
		1.3. Hard drive - 2 TB		
		1.4. OS - Linux		
2	Gateway	2.1 Short range (30m)	2.1.1. Processor - Quad core, 1.2 GHz, 64 Bit	
			2.1.2. Memory - 1GB RAM, 8 GB ROM	
			2.1.3. OS - Open source Linux	
			2.1.4. Operating frequency - 2.4 GHz or Sub-1	
			2.1.5. Interface support - Ethernet, Wi-Fi, ZigBee, Bluetooth and BLE	
			2.1.6. Protocol support - 6LBR, 6LoWPAN, HTTP, RPL, MQTT, and COAP	
		2.2. Long range (1Km)	2.2.1. Processor - Quad core, 1.2 GHz, 64 Bit	
			2.2.2. Memory - 1GB RAM, 8 GB ROM	
			2.2.3. OS - Open source	
			2.2.4. Operating frequency - Sub-1 GHz	
2.2.5. Interface support - 4G / 3G / GPRS/GPS/ LoRa / Sigfox				
		3.1.1. Protocols - 6Lowpan stack with COAP, MQTT and mesh routing (e.g., RPL)		

3	6Lowpan node	3.1. High processing capability	3.1.2. OS- Open source operating systems (e.g., Contiki)	
			3.1.3. Sensor/Actuator- Programmable for sensing and actuating	
			3.1.4. GPIOs- Minimum 5 for sensor and 5 for actuators	
			3.1.5. Operating frequency- 2.4 GHz or Sub-1 GHz	
			3.1.6. RAM- 32 Kb	
			3.1.7. Flash- 512 kB	
			3.1.8. Power supply buy USB and battery	
			3.1.9. Programmable with debugger or without debugger	
			3.1.10. Processor- ARM-cortex M3 based MCU	
			3.1.11. On-board ADC resolution: 12 bit 8 Channel ADC	
			3.2. Low processing capability	3.2.1. Protocols- 6Lowpan stack with COAP, MQTT and mesh routing (e.g., RPL)
	3.2.2. OS- Open source operating systems (e.g. Contiki)			
	3.2.3. Sensor/Actuator- Programmable for sensing and actuating			
	3.2.4. GPIOs- Minimum 3 for sensors and 1 for actuators			
	3.2.5. Operating frequency- 2.4 GHz			
	3.2.6. RAM- 16 kB			
	3.2.7. Flash- 128 kB			
	3.2.8. Power supply buy battery			

			3.2.9. Programmable with debugger or without debugger	
			3.2.10. Processor- ARM-cortex M3 based MCU	
			3.2.11. On-board ADC resolution: 12 bit 8 Channel ADC	
4	Wi-Fi node	4.1. 802.11a/b/g/n	4.1.1. Device driver- Open source	
			4.1.2. Sensor/Actuator- Programmable for sensing and actuating	
			4.1.3. Operating frequency- 2.4/5 GHz	
			4.1.4. GPIOs- Minimum 5 for sensors and 3 for actuators	
			4.1.5. RAM- 32KB	
			4.1.6. Flash- 512 KB	
		4.1.7. Processor- 32 Bit ARM MCU		
	4.2. 802.11ah	Basic features of 802.11ah like DTIM, TIM, AID, RAW and TWT need to supported		
5	RFID	5.1 Reader	5.1.1. Signal : Current 13mA	
			5.1.2. Working voltage: 3.3V	
			5.1.3. Operating Frequency: 13.56MHz	
		5.3. Writer	5.1.1. Signal : Current 13mA	
			5.1.2. Working voltage: 3.3V	
			5.1.3. Operating Frequency: 13.56MHz	
5.2 Tag	5.2.1. Operating Frequency: 13.56MHz			
6	LoRa		6.1. Device driver- Open source	
			6.2. Sensor/Actuator- Programmable for sensing and actuating	
			6.3. Operating frequency- Sub-1 GHz	

		6.4. GPIOs -Minimum 3 for sensor and 3 for actuators	
		6.5. RAM - 8KB	
		6.6. Flash - 128 KB	
7	SigFox	7.1. Device driver - Open source	
		7.2. Sensor/Actuator - Programmable for sensing and actuating	
		7.3. Operating frequency - Sub-1 GHz	
		7.4. GPIOs -Minimum 3 for sensor and 3 for actuators	
		7.5. RAM - 8KB	
		7.6. Flash - 128 KB	
8	Daylight sensor	8.1. Compatible with Wi-Fi and 6Lowpan nodes	
		8.2. Working voltage - 3.3/5V	
9	Motion sensor	9.1. Compatible with Wi-Fi and 6Lowpan nodes	
		9.2. Working voltage - 3.3/5V	
10	Camera	10.1. Compatible with Wi-Fi and 6Lowpan nodes	
		10.2. Support with ARM based MCU	
		10.3. Pixel - VGA/PIXEL	
		10.4. Resolution - Minimum 640x480	
11	Soil moisture sensor	11.1. Compatible with Wi-Fi and 6Lowpan nodes	
		11.2. Operating voltage - 3.3/5V	
12	Proximity sensor	12.1. Compatible with Wi-Fi and 6Lowpan nodes 12.2. Operating Voltage - 3.3/5V	
13	Humidity Sensor	13.1. Compatible with Wi-Fi and 6Lowpan nodes 13.2. Operating Voltage - 3.3/5V	
14	Temperature Sensor	14.1. Compatible with Wi-Fi and 6Lowpan nodes	

		14.2. Operating Voltage - 3.3/5V	
15	Pressure Sensor	15.1. Compatible with Wi-Fi and 6Lowpan nodes 15.2. Operating Voltage - 3.3/5V	
16	Wind Sensor (Speed and Direction)	16.1. Compatible with Wi-Fi and 6Lowpan nodes 16.2. Operating Voltage - 3.3/5V	
17	Rainfall Sensor	17.1. Compatible with Wi-Fi and 6Lowpan nodes 17.2. Operating Voltage - 3.3/5V	
18	Street LED bulb	18.1. Outdoor setup with Water Proof features	
		18.2. Operating Voltage - 200 V	
		18.3. Brightness - 3000 lm	
		18.5 Working Life - up to 30000hrs	
		18.4. Operating Wattage - 15 W	
19	Street Lamp post	19.1. Height - 2m 19.2. For supporting to street LED bulb	
20	Normal LED bulb	20.1. Compatible with Wi-Fi and 6Lowpan nodes	
		20.2. Operating Wattage - 7 W	
		20.3. Operating Voltage - 220 Volts	
		20.4. Brightness - 1000lm	
		20.5. Color Temperature : 6500K	
		20.6. Power and Plug should be AC	
		20.7. Cap type - B22	
21	Channel relay	21.1. To switch ON/OFF the actuators	
		21.2. Type - 1 channel relay	
		21.3. Signal - High current (7-10A)	
		21.4. Working voltage - 5V or 3.3V	
		21.5. Compatible with AC and DC appliances	
22	Smart Phone	22.1. Use as a remote device	

		22.2. To test Android applications	
		22.3. OS- Android 5.5 and above	
		22.4. RAM- 4GB	
		22.5. ROM- 32GB	
		22.6. Processor -Octa core, 64 bit, 1.5 GHz	
23	Tablet PC	22.1. Use as a remote device	
		22.2. To test Android applications	
		22.3. OS- Android 5.5 and above	
		22.4. RAM- 5GB	
		22.5. ROM- 32GB	
		22.6. Processor -Octa core, 64 bit, 1.5 GHz	
24	ISP JTAG cable	24.1. Type- 10 Pin, 1.27mm Pitch, IDC socket, Flat Ribbon	
25	Micro SD Card	25.1. Capacity- 16GB	
26	Pen drive	26.1. Capacity- 64 GB	
		26.2. Interface- USB 3.0	
27	USB ttl	27.1. Interface- USB 2.0	
		27.2. Operating Voltage – 3.3/5V	
28	Installation of Testbed (50 Street lights)	28.1. Powering and wiring of LED bulb for street lights	
		28.2. Relay Components	

Annexure- III

Sl. No.	Item	Quantity	Unit Price	Total Price (Inclusive of all taxes)
1	Server	1		
2	Gateway	2.1. Short range (30m)	4	
		2.2. Long range (1Km)	2	
3	6LoWPAN node	3.1. High processing capability	50	
		3.2. Low processing capability	200	
4	Wi-Fi node	4.1. 802.11a/b/g/n/ac	50	
		4.2. 802.11ah	5	
5	RFID	5.1. Reader	15	
		5.2. Writer	5	
		5.3. Tag	200	
6	LoRa	3		
7	SigFox	3		
8	Daylight sensor	150		
9	Motion sensor	150		
10	Camera	50		
11	Soil moisture sensor	20		

12	Proximity sensor	50		
13	Humidity Sensor	50		
14	Temperature Sensor	50		
15	Pressure Sensor	20		
16	Wind Sensor (Speed and Direction)	2		
17	Rainfall Sensor	10		
18	Street LED bulb	50		
19	Street bulb post	50		
20	Normal LED bulb	50		
21	Channel relay	200		
22	Smart Phone	2		
23	Tablet PC	1		
24	ISP JTAG cable	200		
25	Micro SD Card	10		
26	Pen drive	4		
27	USB ttl	10		
24	Installation of testbed	50 street lights		
Grand Total=				
In Rs.				

Annexure-IV

Terms & Conditions:

1. All vendors should mention the compatibility (Yes/No) of each specifications for all the items.
2. One year warranty for the items with serial nos. 1-4, 6-7, 18, 22-23 shall be considered.
3. Prices quoted shall include all the taxes.
4. All vendors should mention unit price of each item along with the total price (i.e., unit price x quantity). Price quotation shall be given in a separate closed envelope in the sample format shown in Annexure-III. Quotation not following the given format shall be liable for cancelation.
5. Quotations shall be submitted in sealed envelope to “The Chief Investigator, *QoS Provisioning in Internet of Things (IoT)*, Department of Information Technology, North Eastern Hill University, Shillong-22”. The last date of submission is 31/03/2017 on or before 4:00 pm.
6. The decision of purchase committee shall be final.
7. For any clarification kindly contact Dr. Md. Iftekhar Hussain, Assoc. Prof., Department of Information Technology, NEHU, Shillong.