t:pot

TIPOT DEVELOPMENT KIT
for 6LoWPAN wireless sensor networks
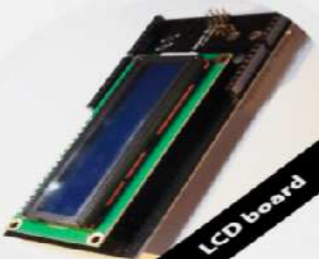
PRODUCTS

TIPoT 3G gateway

eHealth auxiliary board

TIPoT long range communication board and Ethernet gateway

TIPoT motes

SEGGER J-Link plugin

TIPoT Ethernet gateway

TIPoT USB stick sniffer
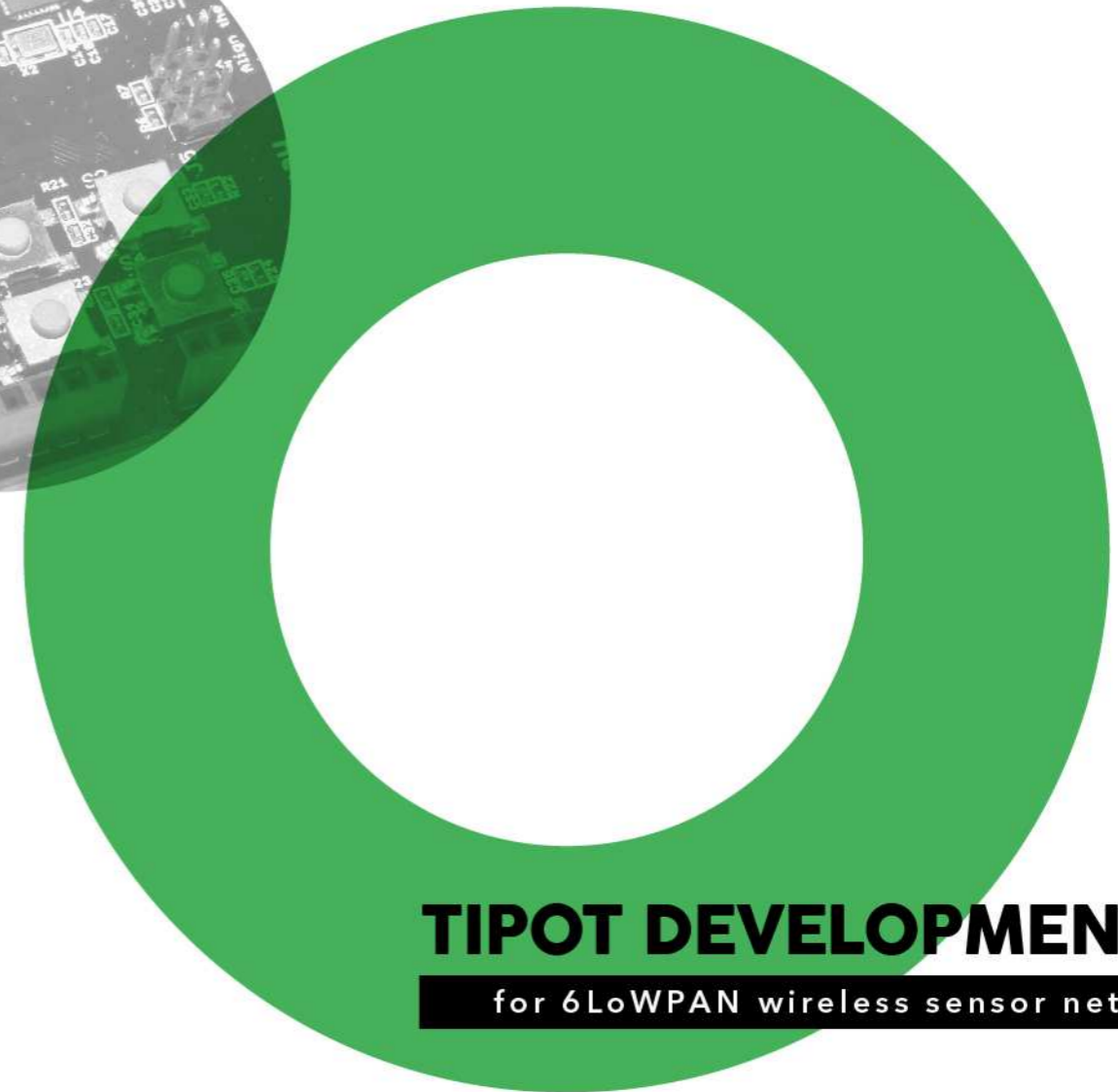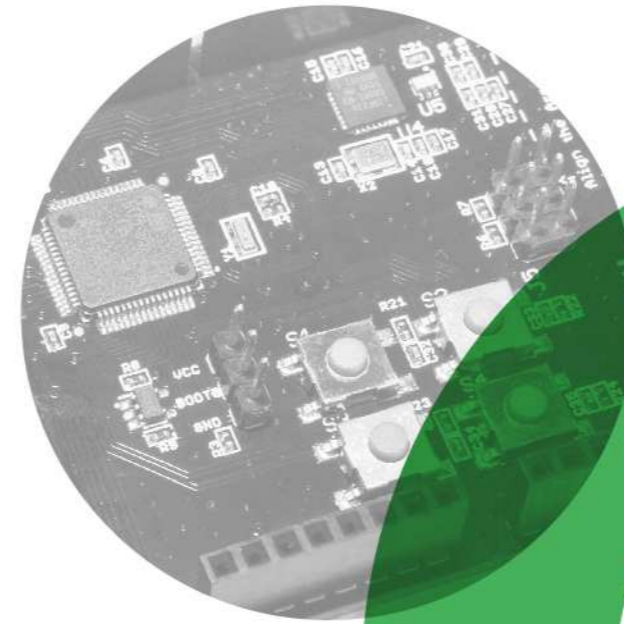
Light, temperature & humidity sensor board

LCD board

TIPoT Development kits can contain different combinations of the above products to suit different needs of our customers. Multiple sensors and actuators can be connected directly to TIPoT motes or to auxiliary sensor boards.

TIPoT sniffer allows monitoring of traffic between TIPoT nodes in the network, displayed on a computer screen. Monitoring provides the opportunity for:

- students and teachers in wireless sensor/actuator networks;
- control exchanges to observe various network behaviors;
- researchers to develop a clear and intuitive understanding of data and product developers to debug prototypes;
- entrepreneurs to demonstrate proof-of-concept innovations.

tipot

TIPoT Technologies Inc.

TIPOT DEVELOPMENT KIT
for 6LoWPAN wireless sensor networks

Address: 555 Legget Drive, Tower A, Suite 304
Kanata ON K2K 2X3,
Canada
Tel: +1-613-790-7608
Email: info@tipottechnologies.com
Web: www.tipottechnologies.com

INTRODUCTION

Wireless Sensor Network (WSN) is an essential part and key enabler of the Internet of Things (IoT), where hundreds or thousands of small smart sensing or control nodes are interconnected to transmit sensing/monitoring information or control instructions. In order to implement sensing/monitoring or control services at a large scale with seamless connection to the Internet, IPv6 would be the best solution due to its many advantages including its highly scalable address scheme, stronger security, and full Internet compliance. Therefore, IPv6 over WSN is getting more research and development (R&D) attention from both industry and academia.

The TIPoT kit offers a very effective, flexible, and low-cost development platform, including an end-to-end application framework, for the experimental research of TCP/IPv6 over IEEE 802.15.4 WSN, as well as prototype development of various products for WSN or IoT. It allows students, teachers, researchers, hobbyists, makers, product developers and entrepreneurs to build and debug low-power, low bandwidth ad-hoc wireless sensor/actuator networks with full TCP/IPv6 internetworking. Users can connect their own sensors, add more nodes and develop or evaluate the functionality of their devices/applications that are built on IPv6 over WSN.

TIPoT development kit has been adopted in graduate student thesis research projects at the University of Ottawa, Canada, and computer engineering project at the Algonquin College, Canada. Large scale testbed deployments are being planned at the University of Ottawa and University of Montreal. In addition, TIPoT kits are being adopted for product prototyping or establishing testbeds for quite a few applications, including smart irrigation, precision agriculture and building structural monitoring, in a number of research/engineering institutions in Africa, Europe, North America and Asia.

Inspired by the open source initiative and to offer low-cost solution with non-constrained R&D flexibility, the TIPoT platform is developed based on free open source software, with the following notable features:

- Low-cost hardware platform.
- A variety of sensing and display accessories.
- Free, feature-rich Integrated Development Environment (IDE): Eclipse (available at: https://eclipse.org/)
- Free, feature-rich network protocol analyzer: Wireshark (available at: https://www.wireshark.org/)
- Open source operating system, Contiki (www.contiki-os.org), offers extensive design, research and development flexibility.
- Arduino shield pinout compatible.
- Software suite includes typical sensing, monitoring, and control application examples, as well as an end-to-end application framework, all using TCP/IPv6 protocol over IEEE 802.15.4.
- Significantly lowers the cost for test/experimental R&D and/or prototyping on TCP/IPv6 over wireless sensor network.

PRODUCT FEATURES

TIPoT Ethernet gateway
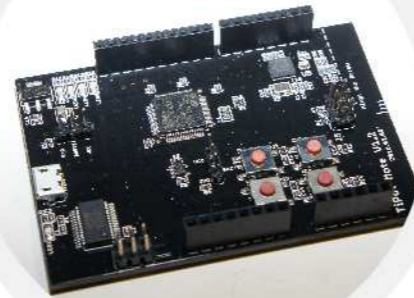
TIPoT motes

eHealth auxiliary board

TIPoT 3G gateway

PRODUCTS

TIPoT USB stick sniffer

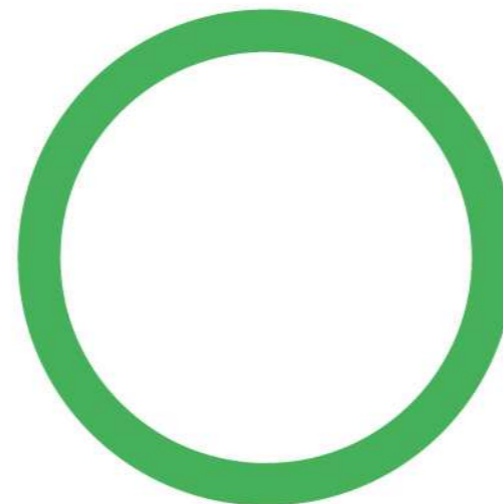
SEGGER J-Link adapter

TIPoT long range communication board and Ethernet gateway

LCD board

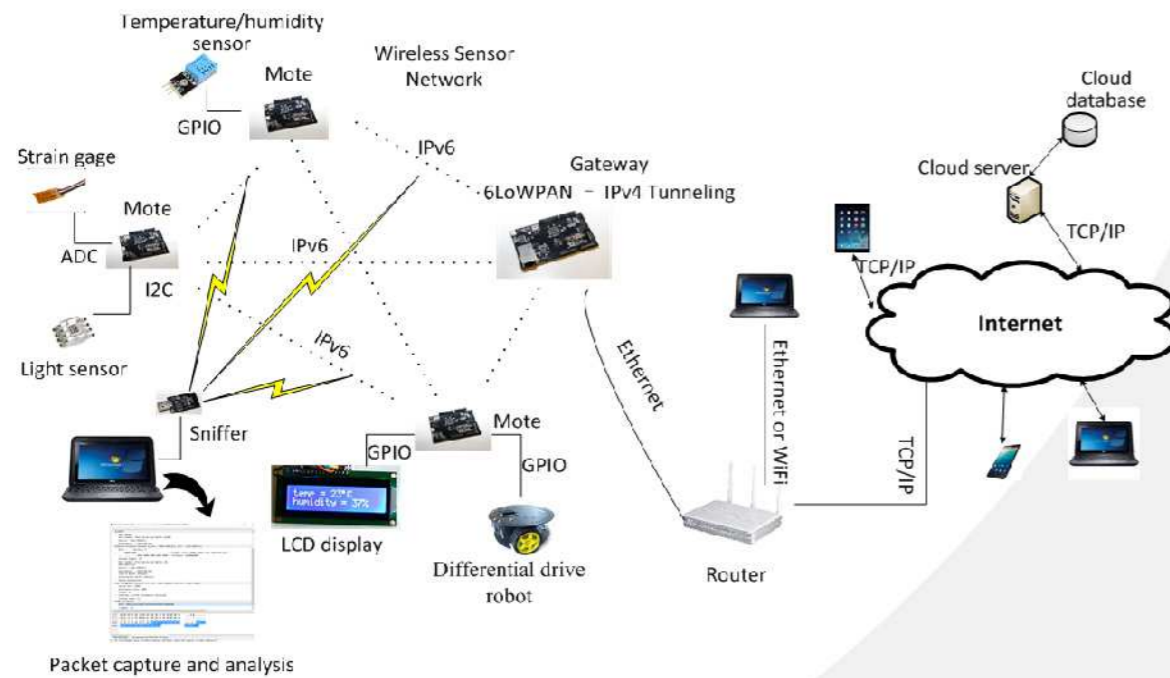**Light, temperature & humidity sensor board**

TIPoT Development kits can contain different combinations of the above products to suit different needs of our customers. Multiple sensors and actuators can be connected directly to TIPoT motes or to auxiliary sensor boards.

TIPoT sniffer allows monitoring of traffic between TIPoT nodes in the network, displayed on a computer screen. Monitoring provides the opportunity for:

- students and teachers to develop a clear and intuitive understanding of data and control exchanges in wireless sensor/actuator networks;
- researchers to observe various network behaviors;
- product developers to debug prototypes;
- entrepreneurs to demonstrate proof-of-concept innovations.

TYPICAL TESTBED SETUP OR APPLICATION SCENARIOS

Temperature/humidity sensor
Mote
Wireless Sensor Network
GPIO
Strain gage
Mote
IPv6
ADC
IPv6
I2C
Light sensor
Sniffer
GPIO
Mote
GPIO
LCD display
Differential drive robot
Gateway
6LoWPAN – IPv4 Tunneling
Ethernet
Ethernet or WiFi
Router
Cloud database
Cloud server
TCP/IP
TCP/IP
Internet
TCP/IP
Packet capture and analysis

Description:

This figure illustrates typical testbed setup or application acenarios with end-to-end application framework. Various sensors (e.g. temperature, humidity, light, and strain gage) collect sensing/monitoring data; the motes receive and process the data, then transmit it to the gateway wirelessly through the IEEE 802.15.4 WSN using TCP/IPv6. The gateway provides network address translation (NAT64) so that the IPv6 packets can be forwarded to the cloud server with its IPv4 Ethernet interface and then store in the cloud database. Computer, tablet, or smart phone can be used to access the sensing/monitoring data through Internet. Users can also send control commands to cloud server, which will then pass them to the gateway and from there to the robot that is equipped with a TIPoT mote. After the messages are passed and interpreted by the appropriate client software on the robot, the control commands they carry are applied on the robot's functionality.
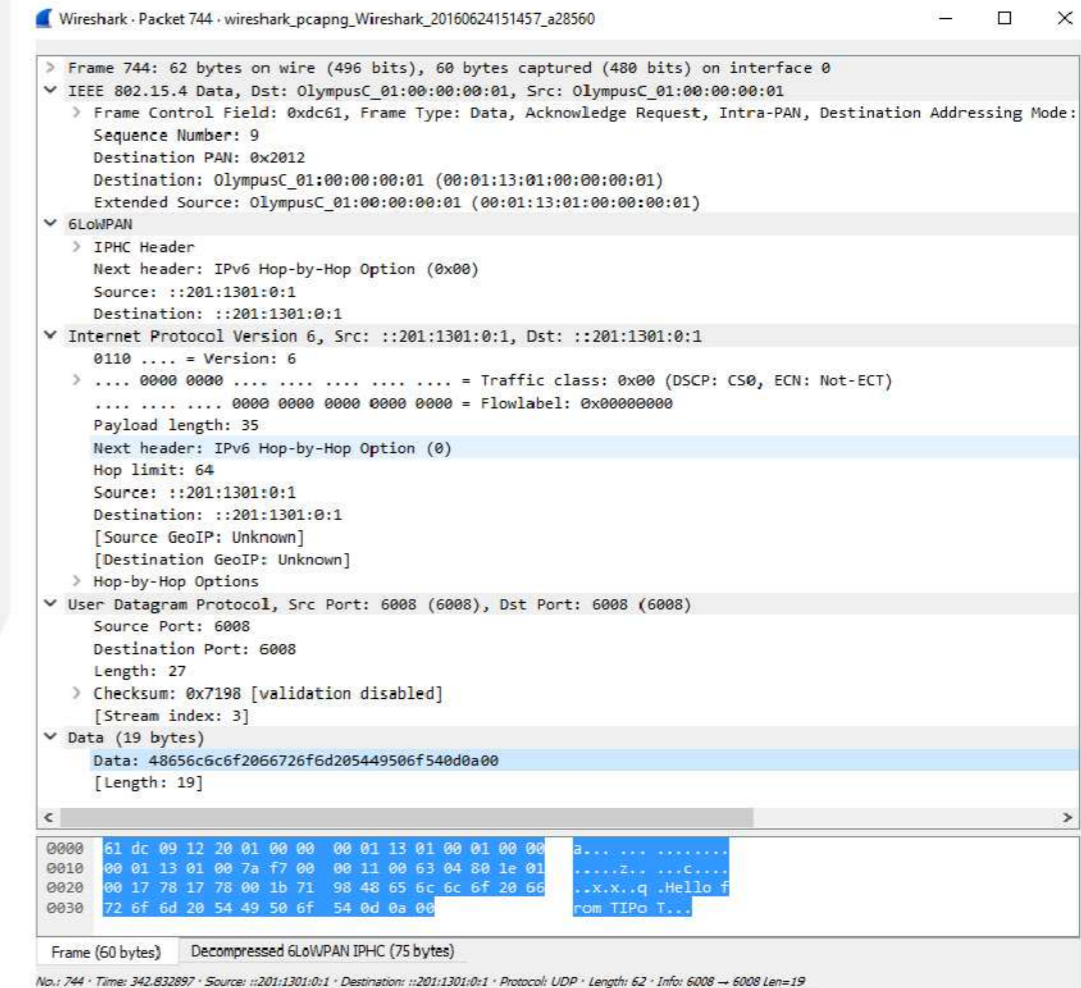
SCREENSHOTS OF CAPTURED PACKETS