The Constrained Application Protocol for the Internet of Things in Transport Logistics

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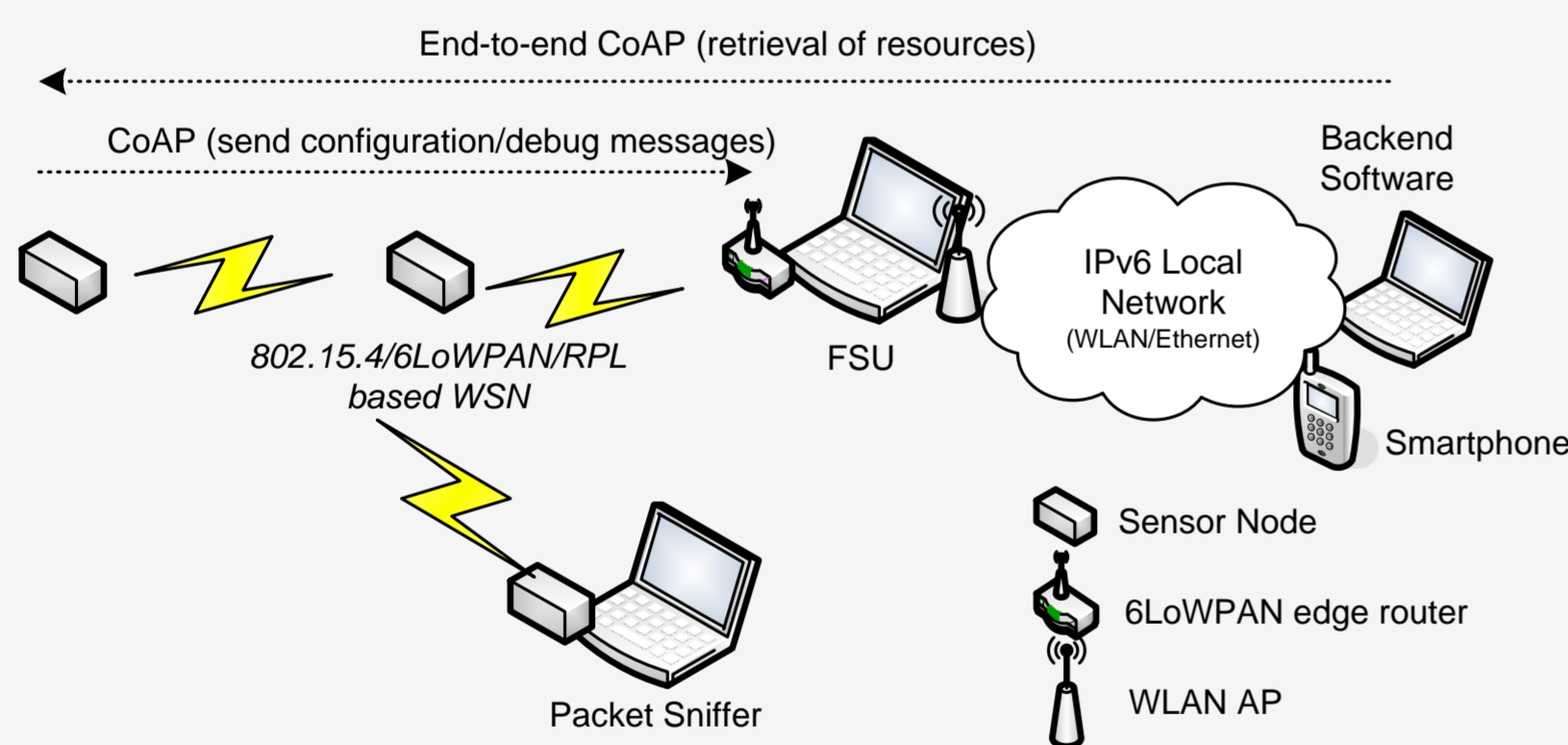
Motivation

- Wireless Sensor Networks (WSNs) allow access to Things beyond Identification: Sensing & Actuation
- Internet Protocol is becoming feasible and standardised for Wireless Sensor Networks
- Hypertext Transfer Protocol (HTTP) is not suitable to those networks though
- Internet Engineering Task Force (IETF) is standardizing Constrained Application Protocol (CoAP)
  - Representational State Transfer (REST)
  - Based on UDP, but integrated retransmission scheme
  - For constrained nodes and links (e.g. IEEE 802.15.4)
- CoAP for M2M communication in logistic applications to supervise environmental conditions during transport of a cargo container
- CoAP over WSNs, local area and cellular networks
- Server and Client implementation of CoAP for POSIX systems, TinyOS and Android
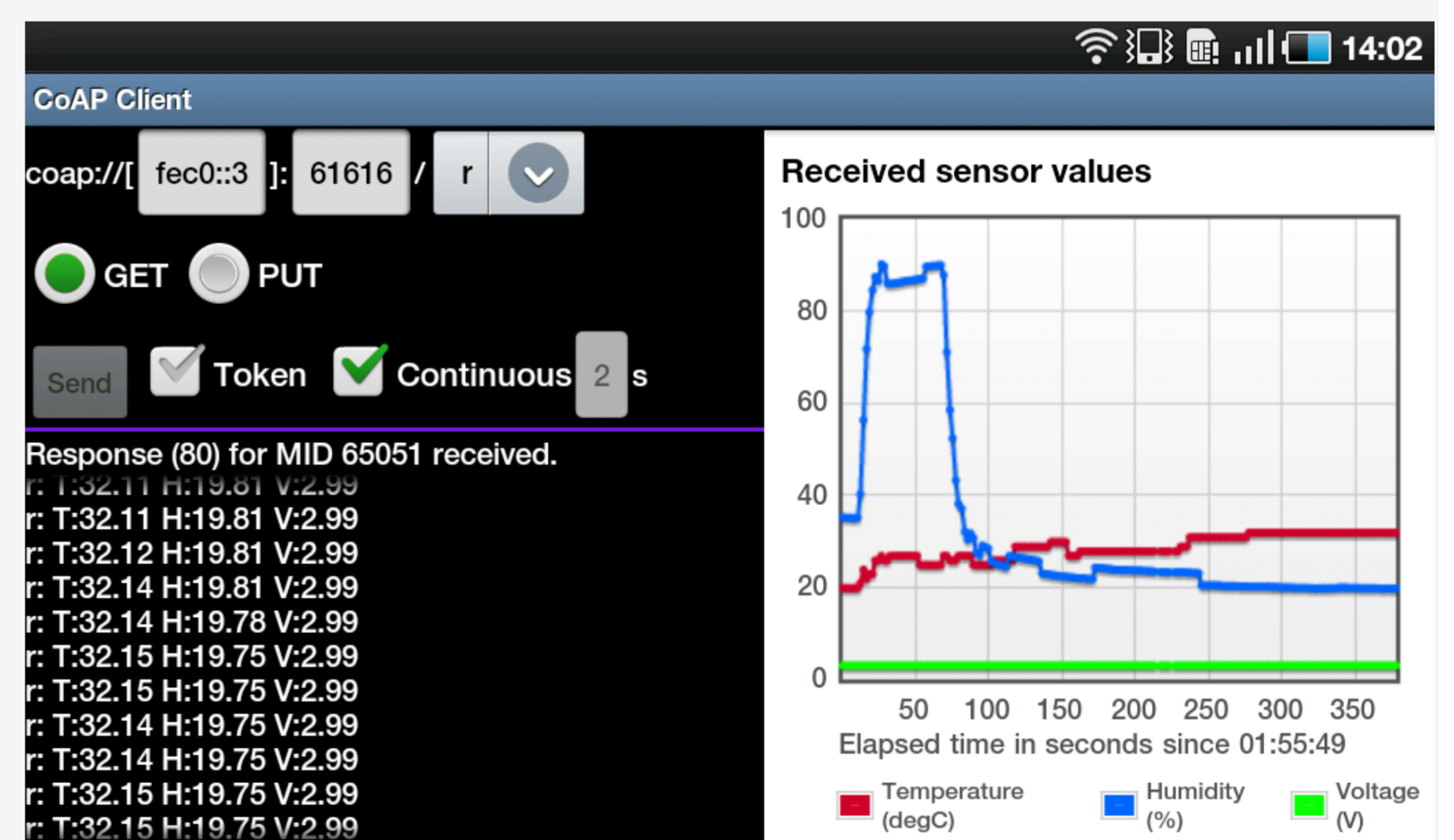
Example: Usage of CoAP in M2M Communications

- CoAP is used in the WSN part of the "Intelligent Container" to manipulate resources (e.g. temperature, humidity) by using the following methods:
  - GET: retrieve resources
  - PUT: modify existing resources

	Resource	GET	PUT	Description
Sensor Nodes	/st	X		Temperature
	/sh	X		Humidity
	/sv	X		Voltage
	/r	X		Temperature, humidity and voltage together
	/l	X	X	LEDs
	/ck	(X)	X	AES Encryption Key
	/rt	X		Routing Table
Telematic	/ni		X	Inform about node integration into 6LoWPAN network
	/ri		X	Inform about node's routing table

Demo Setup

End-to-end CoAP (retrieval of resources)
CoAP (send configuration/debug messages)
Backend Software
IPv6 Local Network (WLAN/Ethernet)
802.15.4/6LoWPAN/RPL based WSN
FSU
Smartphone
Sensor Node
6LoWPAN edge router
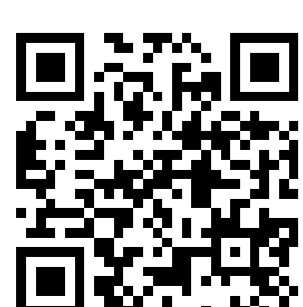WLAN AP
Packet Sniffer

Smartphone Screenshot

QR-labelled Sensor Node

- Sensor Node is an Internet Server
- QR code contains URI with IPv6 address, i.e. `coap://[fec0::3]`
- Resource discovery build into CoAP, i.e. `/.well-known/core`

Further Information

http://docs.tinyos.net/tinywiki/index.php/CoAP (QR code below)

http://libcoap.sourceforge.net/

http://www.intelligentcontainer.com