

REALIZATION OF A NETWORK STACK THAT SUPPORTS TAKS+WIDS ON WSN WITH MOTE RUNNER

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INTRODUCTION

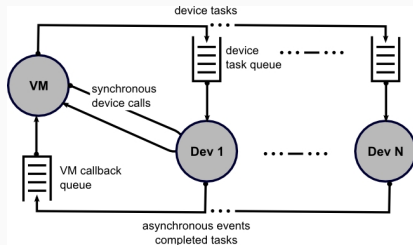
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- Introduction to Mote Runner
- Testing Mote Runner

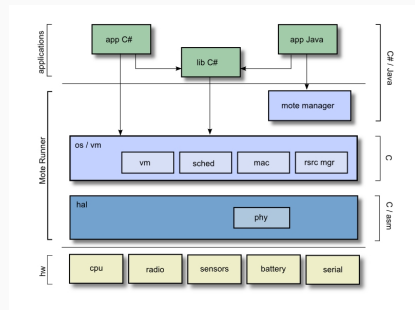
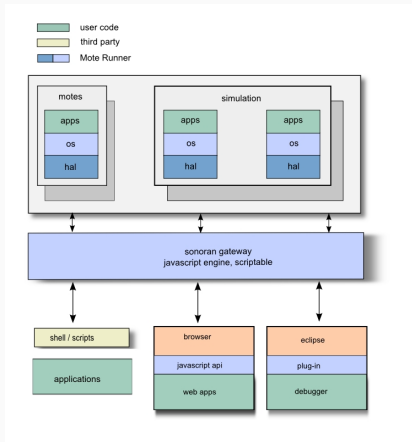
INTRODUCTION TO MOTE RUNNER

- An OS and a runtime and development environment for WSN
- Key features:
 - Support for RT constraints & energy awareness
 - Portability thanks to a VM that abstracts the HW
 - Event oriented programming paradigm
 - High level coding (Java - C#)
 - Debugging & simulation environments
- It's still in beta and is evolving towards IoT

MOTE RUNNER



MOTE RUNNER



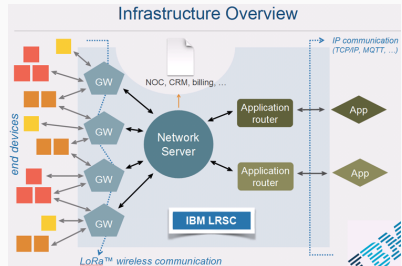
- They support IEEE 802.15.4
 - exposing a low radio level API that can be used to implement custom MAC layer
 - dropping messages with header structure not 802.15.4 compliant in the radio stack
- Offer Hopi
 - A multi-hop data gathering protocol
 - Used to collect data from motes setting automatically a tree network

MOTE RUNNER - V.17.1.8C (LATEST)

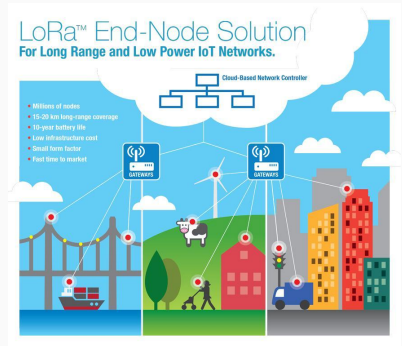
- Supports only two platforms: IMST & Blipper
- It's based on a different radio layer: LoRa™
- It offers a build-in MAC layer: LRSC - Low Range Signaling & Control
 - It supports only a network topology: the LRSC one
 - The offered API is poor since the radio is hidden in the firmware (not compatible with previous versions)

LRSC - ARCHITECTURE

- Gateways (GW) are connected to server on IP
- Motes communicate with server in tunneling TCP/UDP over IP
- Motes communicate with GW with LoRa single-hop



- LoRa™ Alliance
 - Target: IoT, machine-to-machine (M2M), smart city, and industrial applications
 - Initiated to standardize Low Power Wide Area Networks (LPWAN)



- LoRa™Technology
 - LoRaWAN pledges to extend the radio range by 10x while using only one third of the power used by competing solutions
 - Star (of stars?) topology
 - Gateways relay messages between end-devices and a central network server
 - Communication between end-devices and gateways is spread out on different frequency channels and data rates.
 - Data rates: 0.3 - 50 kbps

- ...and more
 - adaptive data rate (ADR)
 - secure communication (on network and application layers and end-point device key)
 - three classes of end-point devices.
 - More info on <http://lora-alliance.org/>

MOTE RUNNER - CONCLUSION

- For the purpose of this work (TAKS & WIDS):
 - MR allows dynamic reprogramming of motes with a control server using WLIP
 - v.17.1.8c is not suitable
 - LoRa is available only for a limited number of platforms (until now!)
 - LRSC doesn't permit to customize the MAC behaviour
 - The radio is not exposed
 - v.11, v.13 are better choices:
 - radio interface could be used to implement an 802.15.4 MAC with TAKS support
 - this MAC could be used to build upper layer with WIDS
- This does not exclude a future integration with LoRa-LRSC

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TESTING MOTE RUNNER

PROBLEMS

- MR v.17.1.3c gave many problem with network operation
- Many experiments've been done trying to make motes communicate without success
- MR v.13 seems to offer what's necessary to complete the task
 - Is it true?
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