The IoT and Thread in PHYTEC Nodes

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Company Introduction
• headquartered in Mainz, Germany
• more than 200 employees worldwide
• Hardware
  • Single Board Computer
  • System on Modules
  • Embedded Imaging
• Software
  • Board Support Packages
  • Yocto Linux distribution
• Test, Support and Lifecycle Management
Custom and Standard Products

- **Standard Products**
  - rapid prototype your application
  - simply order qts from 1 to many 1000
  - e.g. phyCORE (ARM based SoM), phyWAVE

- **Customer specific Hardware Design**
  - we make use of tested building blocks
  - form factor that fits into your housing
IoT Hardware Components
phyNODE - Evaluation

- on board debugger
- sensors, button and signaling
- battery holder
- device USB
- phyWAVE agnostic - generic board for different modules
- dimension: 19 mm x 29 mm
- price/module: 6.50 to 7.20 € (for 1000 pcs)
- PCB or external Antenna via U.Fl
- most GPIOs connected to solder connector
- I2C, SPI, UART, Analog, PWM
• TI CC2650 multi-standard 2.4 GHz RF MCU
• 802.15.4, Bluetooth® Smart
• multi standard SDR
• ARM Cortex-M3, 128KB ROM, 128KB Flash, 20KB SRAM
• RX Current 5.9 mA
• TX Current at 0 dBm: 6.1 mA
- NXP (former Freescale) Kinetis KW2x 2.4 GHz RF MCU
- 802.15.4
- ARM Cortex-M4, 512KB Flash, 64KB SRAM
- RX Current 19 mA
- TX Current at 0 dBm: 17 mA
• build with phyWAVE-KW2x
• Device USB feature of the KW2x SoC
• development and productive use
• virtualized Ethernet over USB or Serial over USB for SBC or Desktop PC
• IEEE 802.15.4 sniffer with Wireshark
NXP Kinetis K64 and dedicated IEEE 802.15.4 transceiver

- Ethernet, PoE
- fits in a flush-mounted box
- ePaper Display
- phyWAVE-KW2x or phyWAVE-CC2650
- BLE/IEEE802.15.4
OS and Software
- http://www.riot-os.org
- LGPL-licensed, hosted on GitHub
- usable with phyWAVE-KW2x
- support for phyNODE-KW2x board and sensors
- 6LoWPAN, IPv6, RPL, CoAP
- in progress: USB Stack implementation for phyNODE/phySTICK/samr21-Board
- http://www.contiki-os.org
- BSD-licensed, hosted on GitHub
- usable with phyWAVE-CC2650
- Texas Instruments port for the CC26xx SoC
- 6LoWPAN, IPv6, RPL, CoAP
• Bluetooth® Low Energy Stack
• http://www.ti.com/tool/ble-stack
• useable with phyWAVE-CC2650
• stack itself closed source, example applications BSD like license
• Threadgroup - http://www.threadgroup.org/
• NXP Thread implementation, Openthread released at Github
• 6LoWPAN, IPv6, Distance Vector Routing, UDP + DTLS, CoAP
• beta version available for phyWAVE-KW2x and phyGATE-K64
Measured with 11R shunt resistor.

\[ V_{\text{max}} = 431\text{mV} \rightarrow I_{\text{max}} = 39.2\text{mA} @ \text{approx} 3.5\text{ms} \]

\[ I_{\text{idle}} = 250\mu\text{A} \]
Validation, Certification and Guidelines
Certification

• phyWAVE modules measured for CE conformity
  • EN 300 328 - RF compatibility
  • EN 301 489 - Electromagnetic compatibility
  • EN 60950-1 - Safety checks

• Bluetooth® SIG certification for phyWAVE-CC2650
  • SW-stack is pre certified
  • Bluetooth® Full Conformance Test
  • Buy a Product Listing at Bluetooth.org

• Internal and External Antenna validated
• hardware manuals and application guides
• Design-in guides for phyWAVE modules
• recommended phyWAVE Footprint
• example schematics for phyWAVE modules
• PHYTEC is a direct distributor
• selling to private and business customers
• order via Mail: order@phytec.de or
• call our Sales team for direct advice
Your Questions.
Hardware Preview
What is better with the NWP KW41Z SoC?

- Lower Power: e.g. 17mA/RX compared to 6.2mA/RX
- Dual Stack via SDR (BLE and IEEE 802.15.4)
- Fast switching times allows simultaneous operation
- in-package dc-dc converter (buck and boost)

- one single AA battery (0.9 to 4.2V)