Accessible IoT for Aerospace Makers

Speaker: Ulrich Norbisrath

Site: http://ulno.net

Videos:
http://youtube.ulno.net

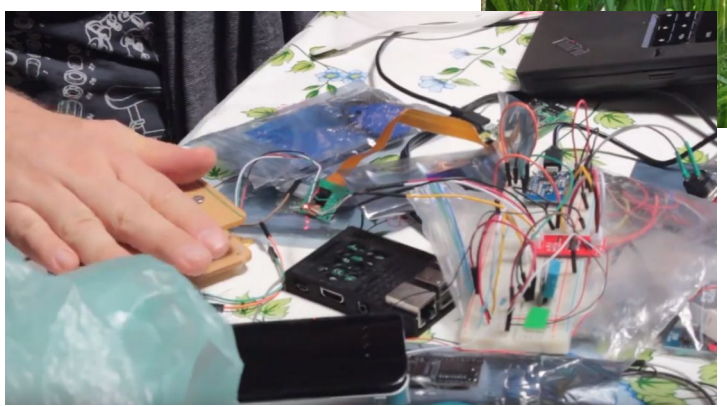
ULno.net

About Me

- Maker/Inventor/Youtuber
- Software Engineering Professor at University of Tartu, Estonia
- Focus on IoT, founder of IoTempower
- Why space and satellites?
  - Connection to IDEIA group at Nasa Spaceapps Challenge

IoT

- Communication
- Data
- Systems



How can we talk in space projects?

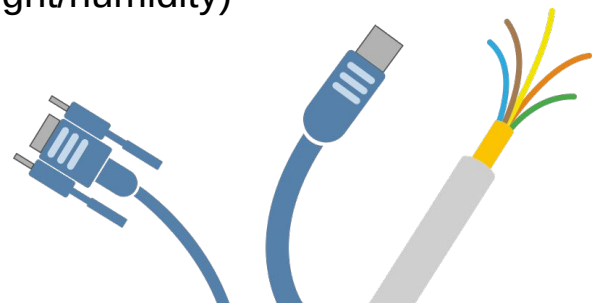
- Think about (technical) ways of communication available to us

How can we talk in space projects?

- Wire(s)
- Sound
- Light
- Radio

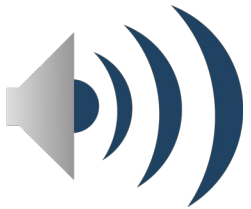
Wire(s)

- Four wires
  - SPI
  - Ethernet (cables usually have 8)
- Two wires
  - serial (RS232, RS485, USB)
  - i2c
- One wire
  - Onewire (I. e. DHT11 and DHT22, Dalles)
  - PWM (for servo motors)
  - Analog (temperature/light/humidity)
  - Bitbanging

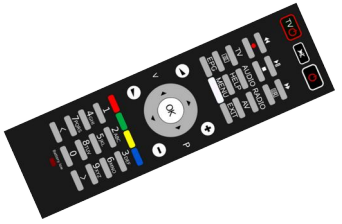


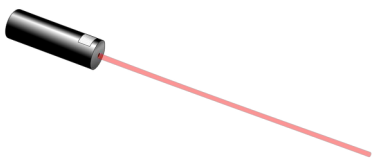
Sound + Light

- Sound
  - Voice
  - Morse (but also on all other mediums)



- Light
  - Infrared (remote)
  - Laser (bit banging)





Radio

- Wifi (2.4 + 5GHz)
- HAM Radio (multiple)
- Lora
  - 433MHz
  - 868MHz
  - 910MHz

Maker Sattelite: Fossasat-1

- LEO Pocket-Cube as LoRa Transceiver
- Goal:
  - Open Source IoT Network
  - Affordable ground stations (did not work in version 1) < USD 20
- Uses 436.7 MHz → license necessary!

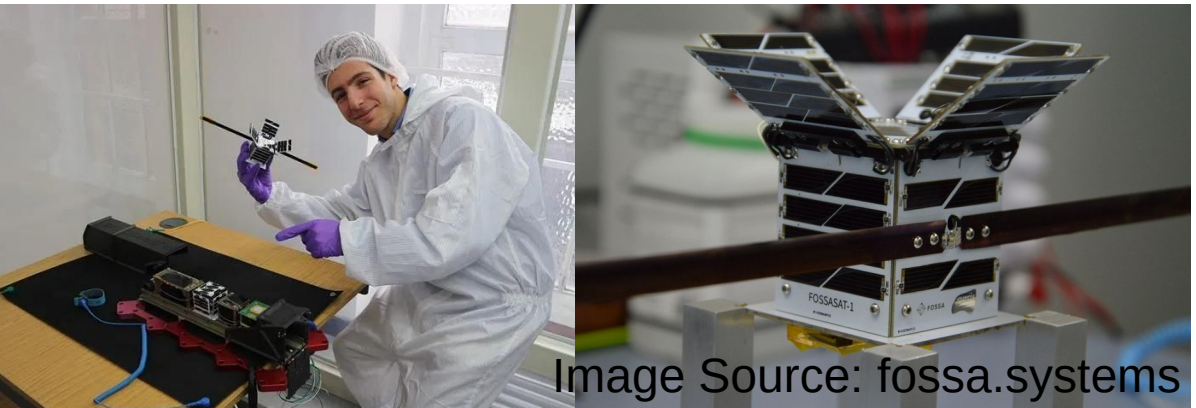


Image Source: fossa.systems

Lacuna

- True LoRa LEO satellite (CubeSat)
- In operation
- Can be reached by cheap ground stations
- Pay per message

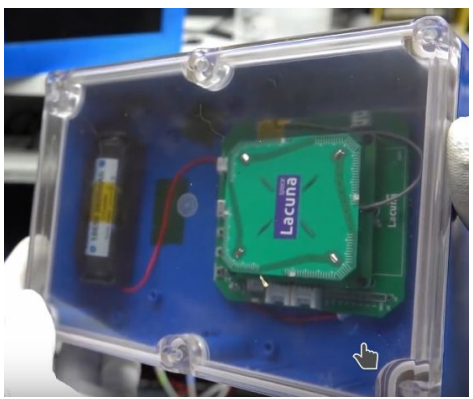


Image credit: Andreas Spiess on youtube, satnews.com, The Things Network, lacuna.space

A case for PJON

https://www.pjon.org

- Lightweight Open Source all-in-one communication solution (minus security)
  - Onewire (Bit Banging)
  - RS485
  - Light/LED/Laser communication
- Radio networks
  - Your own
  - WiFi
  - LORA

Start with esp8266 or esp32

- Most cost effective microcontroller
  (+ built in communication)
- Check
  - ESP NOW
  - ESP Wifi Repeater:
    https://github.com/martin-ger/esp_wifi_repeater

More and (Re-)Connect

- These slides:
  http://presentations.ulno.net
- This part as video (+discussion):
  http://youtube.ulno.net
- IoTempower: http://iotempower.ulno.net
- PJON: https://www.pjon.org
- Andreas Spiess videos:
  https://www.youtube.com/c/AndreasSpiess
  #112, #302, #305
- Fossasat: https://fossa.systems
- Lacuna: https://lacuna.space/