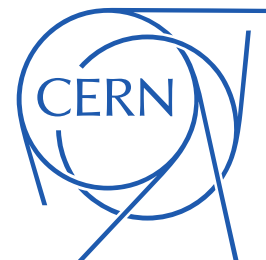




Challenges for connecting Internet of Things devices at CERN

Adam SOSNOWSKI
adam.sosnowski@cern.ch



Agenda

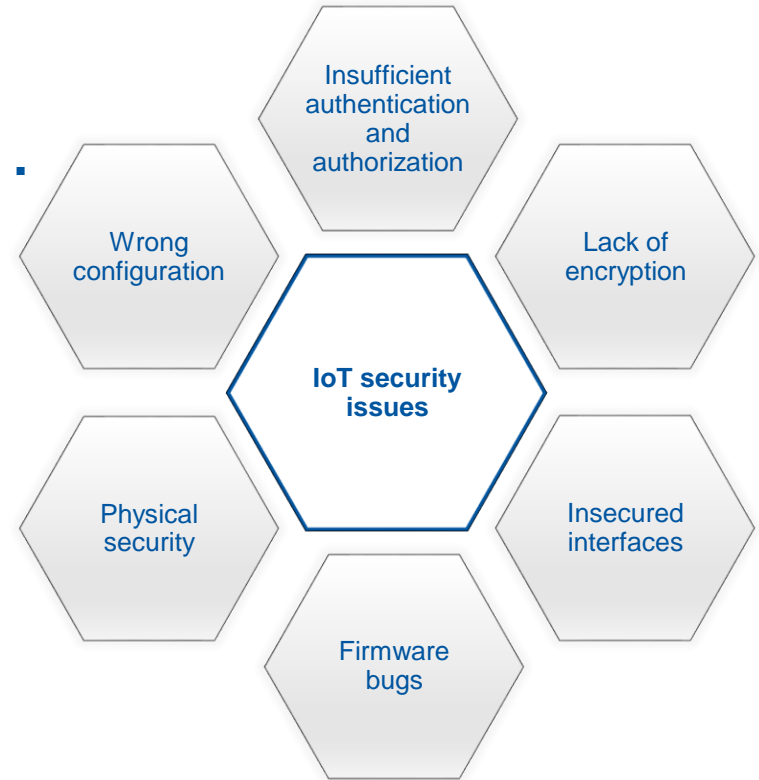
- Internet of Things
- Interconnection of wireless IoT devices
 - Interconnection of outdoor wireless IoT devices
 - Status of LoRa network at CERN
 - Interconnection of indoor wireless IoT devices
- Interconnection of wired IoT devices
- Gathering requirements for IoT at CERN
- Conclusions
- Next steps

Internet of Things

- Big diversity of devices and sensors available in the market
- Different bandwidth requirements
- Different latency sensitivity
- They can support many different connectivity methods

Internet of Things

- Possible security issues...



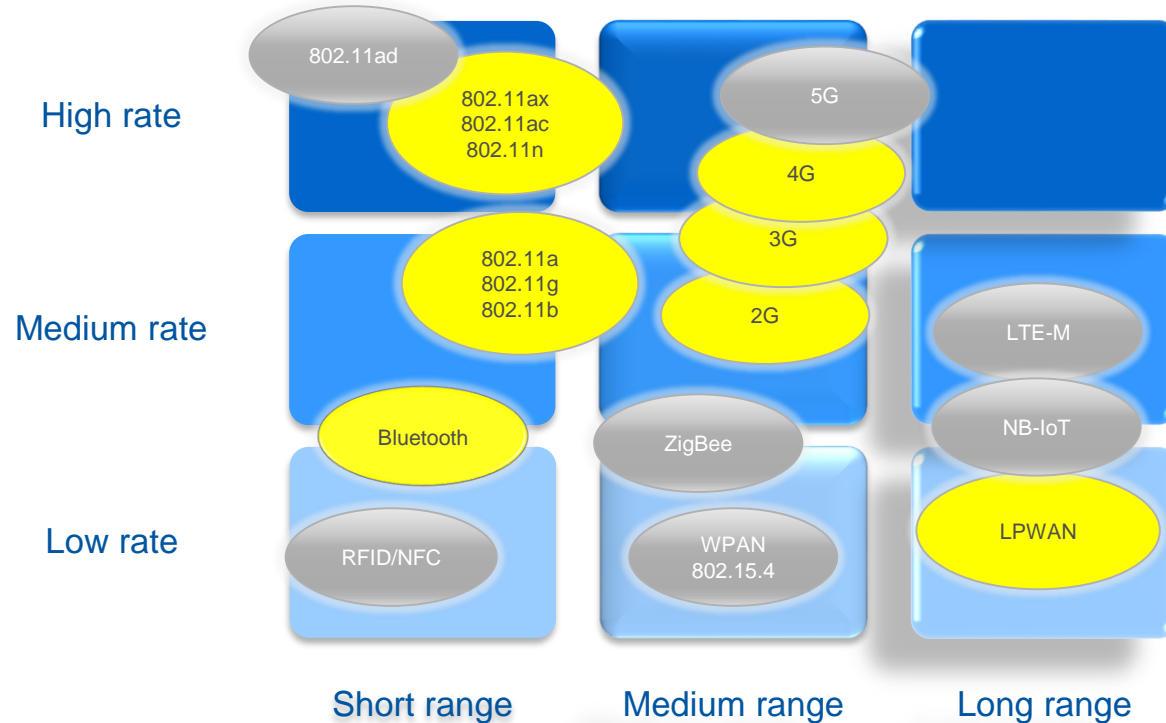
Internet of Things

- Types of devices
 - Wireless (indoor, outdoor)
 - Wired (indoor, outdoor)
- Interconnecting wireless IoT devices
 - Access network
 - Core network



NETWORK OF THINGS

Internet of Things – wireless devices



Interconnection of outdoor wireless IoT devices



Interconnection of outdoor IoT devices

- Networks based on cellular access
 - Cellular M2M
 - Cellular LPWAN
- Unlicensed LPWAN (Low Power WAN)
 - Long range, Long battery life
 - Usually low throughput
 - LoRa (Long Range) network at CERN
- Private LTE networks start to be deployed around the world



LoRa network status at CERN

- Project started in 2017
- One gateway per site (11 in total)
 - One gateway covers wide area
 - All gateways will be installed by end of November 2018
- Main use case is radioprotection
 - Several hundred devices are foreseen to be connected
- Open source system for the core
- More information about the project:
<https://indico.cern.ch/event/637013/contributions/2739267/>



Interconnection of indoor wireless IoT devices



Interconnection of indoor IoT devices

- Bluetooth (IEEE 802.15.1)
 - 2.4 GHz
 - Widely used
- ZigBee (IEEE 802.15.4)
 - 868 MHz, 915 MHz, 2.4 GHz
 - Gaining popularity
- Wi-Fi (IEEE 802.11)
 - 2.4 GHz, 5 GHz
 - Not so popular in IoT world



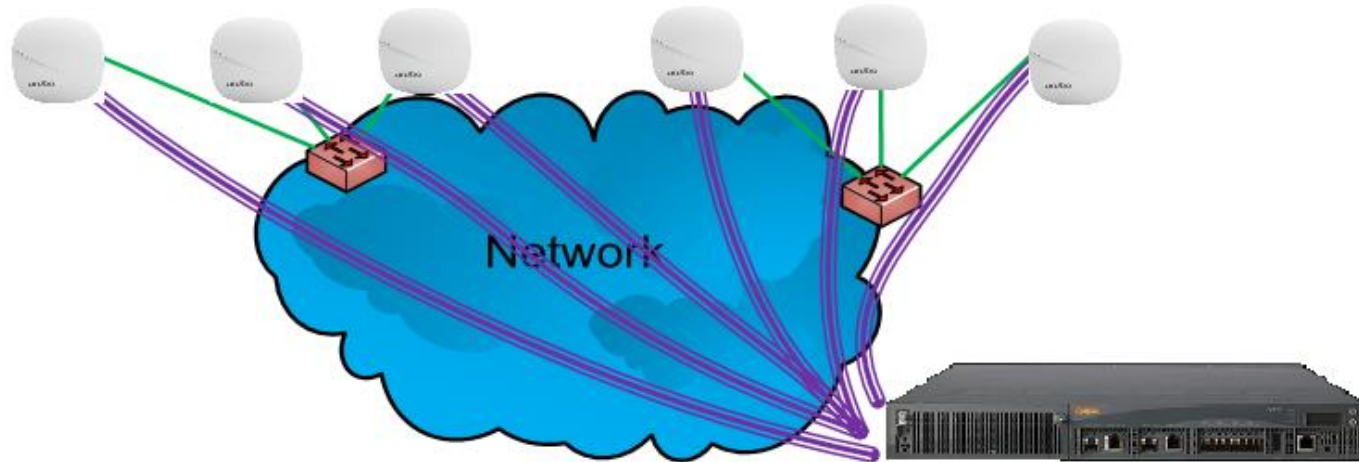
Interconnection of indoor IoT devices

- Wi-Fi manufacturers plan to support more wireless technologies on the APs



Interconnection of indoor IoT devices

- Traffic is tunnelled to the controllers

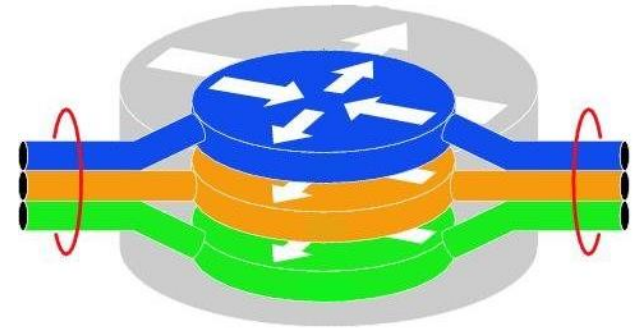


Interconnection of wired IoT devices



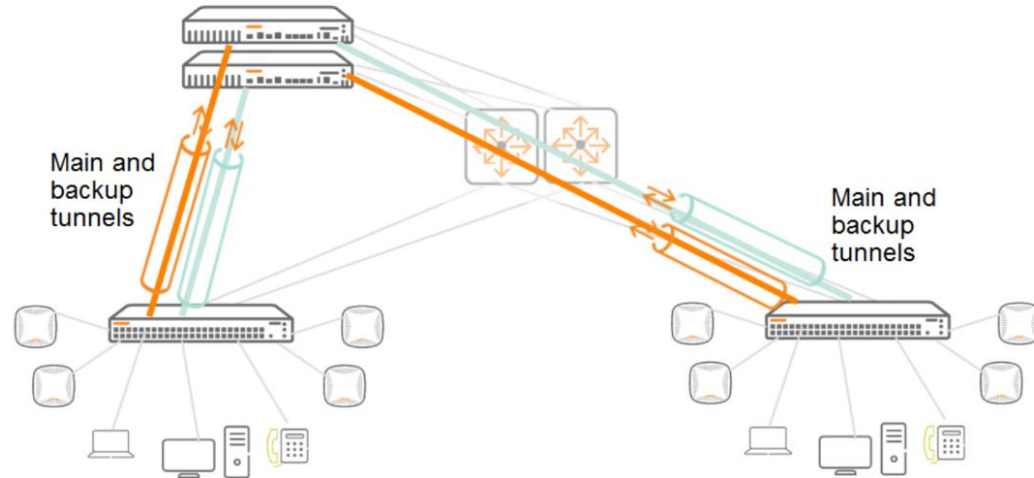
Interconnection of wired IoT devices

- How to separate traffic generated by IoT devices?
 - VRF with MPLS
 - VRF lite
 - VxLAN
 - Proprietary solution
 - Separate infrastructure...



Proprietary solution for wired IoT devices

- Switch acts as an AP
 - Connected and managed by a controller
 - Using tunnels to transport all the traffic to the controller



Gathered requirements

- Survey for planned/expected IoT devices
 - Kind of devices
 - Requirements for access network

- We can expect thousands of IoT devices
 - Inside buildings and tunnels
 - Alongside outdoor areas
 - In cars
 - Both wired and wireless

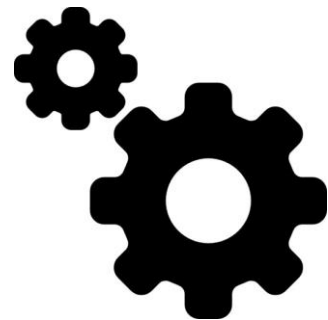


Conclusions

- Security should be a priority
- Separation of IoT traffic
- Automation to detect “bad behaviour”
- Different access networks
- Wide coverage (indoor, outdoor, tunnel)
- Scalability
- QoS
- We have to be ready!

Next steps

- Evaluation of ZigBee



- Solution for wired IoT (VRF lite)



Let's share experiences

- Do you have requests to connect IoT devices to the network?
- Do you provide any network to connect IoT devices?
- Which access technologies do you consider to use to interconnect IoT devices?
- How do you plan to separate IoT traffic from user's traffic?

If you don't know, please forward this presentation (or at least this slide) to your "network" colleagues. They can contact me via adam.sosnowski@cern.ch

Any questions?



