KARYON Kernel-Based ARchitecture for safetY-critical cONtrol

A Tool for Real-Time Assessment Through Fault Injection in IEEE 802.15.4 Networks

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Motivation

Wireless networks increasingly used:

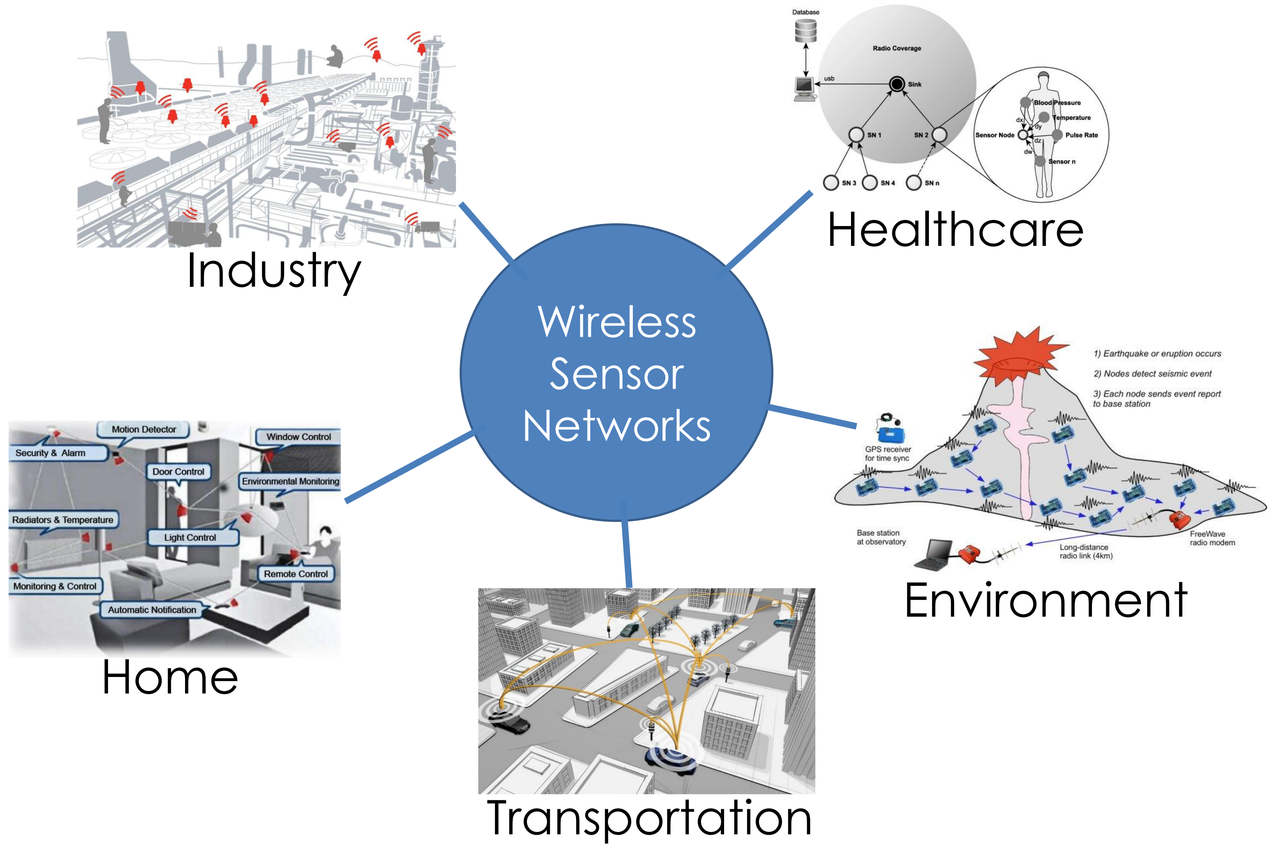
- Size, Weight and Power requirements make them a suitable replacement for a wired network;
- Current standards have been designed towards real-time operation.

However, they are fragile:

- Electromagnetic interferences have the ability to impair communications.

Thus, it is important to:

- Observe the real-time operation in the presence of errors.



Concept

Monitor:

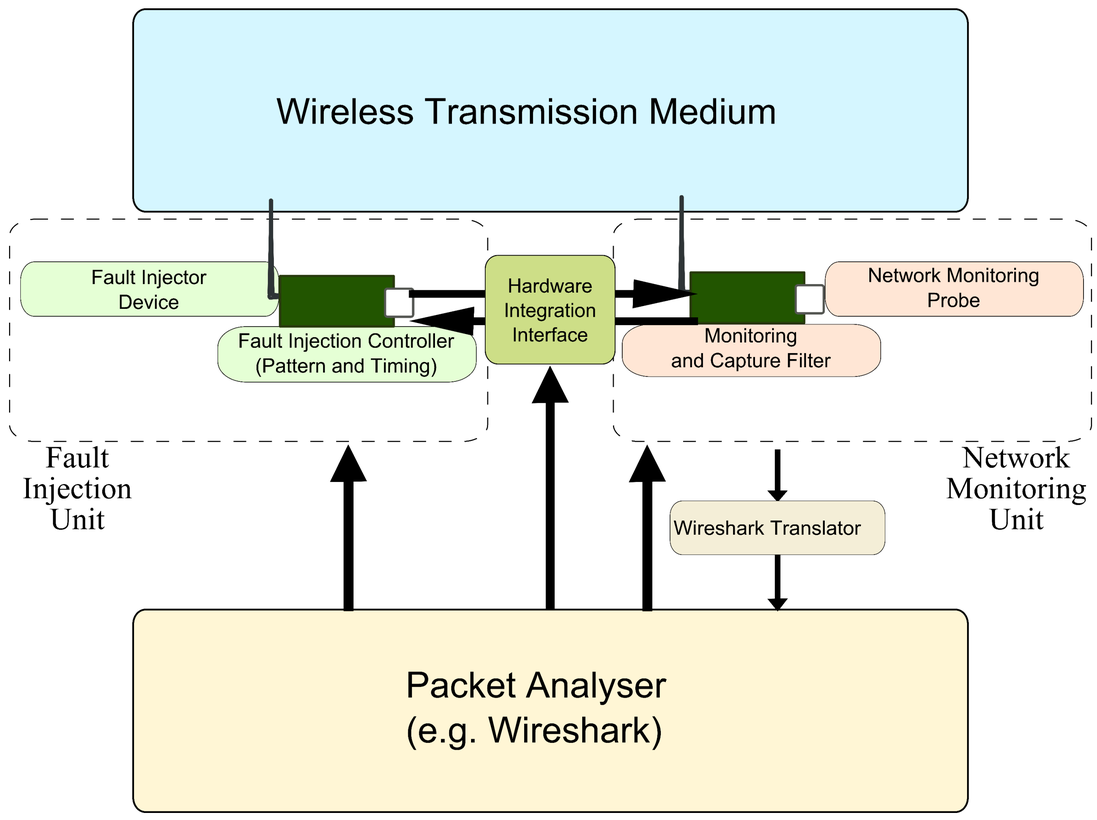
- Capture all frames, including corrupted ones;
- Frames are sent to the analyser as well as written to a CSV file.

Stress:

- Manual parameterisation or use of embedded pre-defined scenarios;
- Injection of noise or MAC symbols;
- Injection may be triggered by specific traffic patterns;

Analyse:

- Report creation by using the CSV file format (Frame Delivery Rate, Frame Error Rate, Energy consumption, etc…) .



Results

Network Monitoring Unit (NMU):

- Captures network traffic.

Fault Injection Unit (FIU):

- Injects noise/symbols to the channel.

Wireshark Translator:

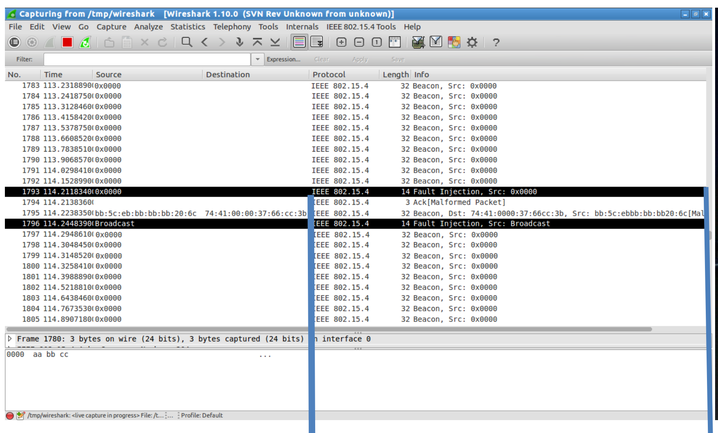
- Captures frames and writes the CSV file while forwarding data to Wireshark.

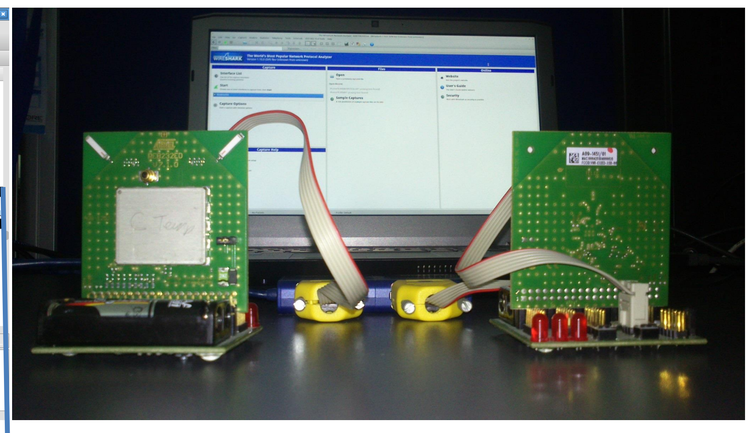
Hardware Integration Interface:

- Integrates the NMU and the FIU.

Extended Wireshark:

- Command and control functions.





IEEE 802.15.4 14 Fault Injection, Src: 0x0000
IEEE 802.15.4 3 Ack[Malformed Packet]
IEEE 802.15.4 32 Beacon, Dst: 74:41:0000:37:66cc:3b, Src: bb:5c:ebbb:bb:bb20:6c[Mal
IEEE 802.15.4 14 Fault Injection, Src: Broadcast

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SEVENTH FRAMEWORK PROGRAMME