Wireless communication infrastructure for smarter medical monitoring

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The fast-growing Internet of Things gives the opportunity to create cheap and universally available intelligent medical monitoring systems. This will enable a significant expansion of the use areas of such services and their standardization in the near future. The main aim of this study is to present a proposal for such a system.

Currently, there are a number of incompatible communication protocols such as:

- ZigBee, RF4CE, MiWi, WirelessHart, SimpliciTI, TI-MAC, LoRa,
- 6LoWPAN, Thread (IP6 on IEEE 802.15.4),
- Blutooth, Bluetooth Smart (Low Energy), Bluetooth 4.2 (Mesh), Blutooth 5.0 (LR, HS),
- WiFi, LiFi (Light Fidelity),
- ANT/ANT+ and proprietary 2.4GHz protocols,
- GSM, LTE, LTE-NB-IoT, Sigfox, LoRaWAN,
- Dedicated communication on free bandwidth ISM i SRD (169, 315, 433, 868, and 915 MHz).

Most manufacturer prefers their own solution, which, unfortunately, results in the lack of integration of communication and the creation of coherent systems.

There is an urgent need to select and standardize communication technology in medical services, both technically and economically optimal.

At the current stage of wireless communication, the most promising solution to the problem of wireless communication in smart medical monitoring systems is Bluetooth 5 technology in combination with WiFi. The structure of such an infrastructure is shown in the figure below:
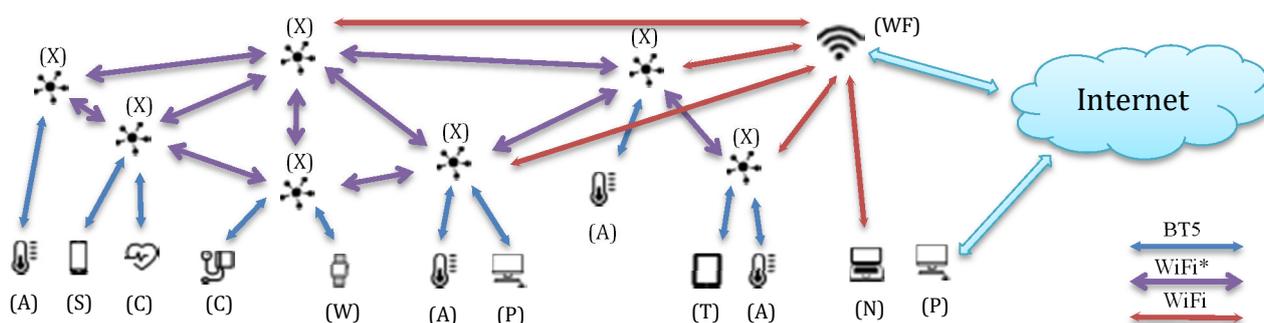

Figure Wireless communication infrastructure for smarter medical monitoring

Communication between sensors located in the environment (A) or on the human (C) and the aggregation point (X) is carried out using Bluetooth 5 (BT5) and the communication between aggregation points (X) is done by modified WiFi with mesh routing (WiFi*). On the other hand, the communication between aggregation points (X) and WiFi access point (WF) is of course implemented by standard WiFi. The proposed and described solution is cheap and can be widely available in a short time. The nRF52840 (Advanced Multi-protocol System-on-Chip Supporting: Bluetooth Low Energy, Bluetooth 5) and WiFi Module - ESP8266 are used here. The smartwatch (W), smartphone (S), tablet (T), notebook (N), or PC (P) equipped with WiFi or Bluetooth 5.0 with the appropriate software can be used on the user's side. Such equipment is cheap and widely available and service is simple and well known.