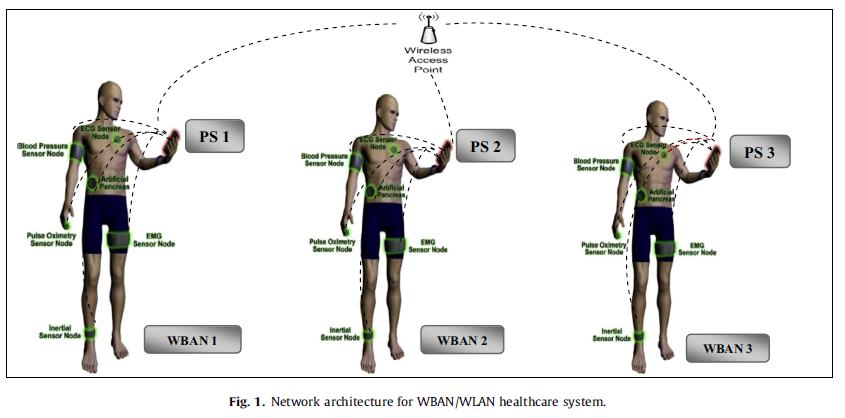
main communication modes for WBAN: intra-body communication and extra-body communication.

Intra-body communication refers to the information exchanged around the human body. It can be a sub-categorized as communication between biosensors, and communication between biosensors and the personal server (PS) as a PDA or smart phone.

Extra-body communication refers to the exchanging data between the PS and the external environment (hospital, doctor,..). we consider the PS employs a WLAN to reach an internet access point, and the access point use the Internet to communicate with final destination.



The challenge is the bridge WBAN and WLAN between IEEE 802.15.6 and IEEE 802.11e. in this paper we will study this bridge, and how PS bridge the WBANs traffic to WLAN networks and aggregate different WBAN frames into WLAN frame. We will also study how data packet classification, WBAN/WLAN bridging system with integration of mapping module and two scheduling mechanisms.

PFA ( priority Frame Aggregation) scheduler performs a scheduling algorithm mapping between WBAN and WLAN, and aggregate them into WLAN frame.

PF (priority frame) scheduler perform scheduling algorithm and mapping between WBAN and WLAN.

The WBAN systems have three-level hierarchies is to process and communicate vital signs. Among sensors used for sensing human body signs we cited: electrocardiogram (EGG), electromyography or EMG, blood sugar, blood pressure, pulse oximeter.

First tiers: mWBAN sensor nodes

ECG is a sensor used to monitoring heart activity. The electrocardiogram records the electrical stimulation to the heart muscle by conduction system and traces the movement of those impulse. In order to obtain an EGG signal, several electrodes are attached at specific sites on the skin, and the potential differences between there electrodes are measured.

The EEG is a test function, used for monitoring brain electrical activity by attaching small electrodes to the human’s scalp at multiple locations. The information of the brain’s electrical activities sensed by the electrodes forwarded to an amplifier for producing a pattern of tracings.

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human’s scalp at multiple locations. The information

of the brain’s electrical activities sensed by the electrodes

forwarded to an amplifier for producing a pattern

of tracings. Synchronous electrical activities in

different brain regions generally assumed to imply

functional relationships between these regions

The EMG involves recording the spontaneous electrical

activity of a muscle or nerve during contractions

or at rest. The electrodes used are very thin and

inserted under the skin on the path of a nerve. An

electrode is used as transmitter and receiver (when

it comes to measuring the nerve conduction velocity

and the velocity of nerve impulses in a nerve).

Blood sugar monitoring is a way of testing the concentration

of glucose in the blood (glycemia). A

blood sugar is also called blood glucose.

Humidity and temperature sensors are used for

measuring the temperature of the human body

and/or the humidity of the immediate environment

around a person.

Second tier: personal server

The sensor nodes process and communicate vital signs.

Before their memory fills, they keep information and issue

them to the personal server [28] that can be implemented

on a PDA or a cell phone or can run on a home personal

computer.

To communicate received data to the central server, the

personal server can employ mobile telephone networks

(2G, GPRS, and 3G) or WLANs to reach an Internet access

point. In our case, the personal server employs a WLAN

to reach an internet access point (e.g., a home gateway)

in order to communicate with the central server. The PS

should, in general, be responsible for the following tasks:

data collection, data processing, data aggregation and data

communication. A flowchart illustrating the PS functionalities

is shown

Data collection: The PS communicates and collects

data from the WBAN sensor nodes. Sensor nodes

encapsulate their data into WBAN messages (or

frames) and forward them to PS.

Data processing: The PS has to process the data

which has been collected in the data collection

phase. It performs three tasks: decode, filter and

convert data. In fact, the message transmitted from

WBAN nodes should be filtered and collected only

those with interesting information.

Data aggregation: The body sensors in wireless body

area networks provide data to the PS (body aggregator)

which is responsible for managing events from sensors. The PS aggregates data received from different

sensors into one frame. This process corresponds

to data fusion.

Data communication: The PS transmits the processed

and aggregated data wirelessly (via WLAN).

MAC access mechanism: background

IEEE 802.15.6 MAC protocol

Description of the standard

The IEEE 802.15.6 [4] operates in and around the human

body (but not limited to humans). It appears to focus on

functioning at relatively low frequencies, less than one

megahertz, short-range use, low cost, reliable wireless

communication, QoS, and especially an ultra low power. every BAN, has one hub and a range of nodes between 1 and 64. The super-frame structure of IEEE

802.15.6 is constructed of nine access phases, which are

beacon, Exclusive Access Phase 1 (EAP1), Random Access

Phase 1 (RAP1), Managed Access phase (MAP), Exclusive

Access Phase 2 (EAP 2), Random Access Phase 2 (RAP 2),

Another Managed Access phase (MAP), Beacon 2 and a

Contention Access Phase (CAP).

\_ EAP1 and EAP2: These access phases are used for

emergency traffics where failure of delivery in a certain

delay, may affect the health of a person and his

life so that, they present the highest priority.

\_ RAP1, RAP2 and CAP: These kinds of access are dedicated

for normal traffic where the data traffic is in

their normal conditions without the critical time

and events upon request.

\_ Managed Access Phases (MAP): This access phase is

used to arrange scheduled uplink, downlink, and

bilink allocation intervals. It can provide unscheduled

bilink allocation intervals, improvise type-I,

but not type-II, immediate polled allocation intervals

as well as posted allocation intervals starting

in this MAP.

\_ Beacon 2: Beacon two frame is dedicated for indicating

the beginning of the CAP phase, grouping

acknowledgment, coexistence information and fast

reservation or adaptation.