

TeleMonitoring in TURKEY

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Grup: TUBITAK 1003 Project (114E452)

Remote Patient Monitoring and Body Area Network using IEEE 802.15.6

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AGENDA

1. Telemonitoring in Turkey : Main Players
2. eNabız Project as ELGA
3. TURKEY in Numbers
4. OECD Data
5. Next Step
6. Remote Patient Monitoring: ETSI SmartBAN Concept
7. Remote Patient Monitoring: IEEE 802.15.6 BAN Standards
8. Status of IEEE 802.15.6 BAN
9. Conclusions



TeleMonitoring in TURKEY: Main Players

1. State owned establishments

1. Social Insurance Institution (SGK)
2. State Hospitals,

State founding for (1) eNabız data base and eNabız.com.tr portal, (2) teleTIP, telemedicine portal for remote monitoring.

Both portals are open for all citizens.

Both projects are continuing from 2014 to 2017.

2. Private Establishments

1. Turkcell
2. Vodafone
3. Avea
4. TurkTelekom

All 4 companies has their establishments on telemedicine or eHealth Through their M2M communication tasks. **But no noticeable application yet.**

3. Hospitals : Some private hospitals supports remote blood sugar and hart rate tracking's.

Yet there is no announcement for servicing through teleMonitoring

eNabız (electronicECG) portal



Visits

Prescriptions

Reports

Illnesses

Analizes

SCANS, FILMS

Donations

Allergies

Have more than gets about 200 to 500 new registrations every day since 4 April 2015

2000-5000 visits every day

Data Base is fully complaint to HL7.

TURKEY in Numbers

Population : 78 Million %50 is younger than 35

Income level on the average : 13.200 USD

70 million GSM and 3G/4G subscriber
%42 of population was Internet User in 2012.

*44 million beneficial from Social Security Institution (SGK)
12 million beneficial from State Pension Institution (ES)*

23 million diabetic illnesses (December 2015, HIMSS in Istanbul)

6 million people with cardio vascular diseases (December 2015, HIMSS in Istanbul)

TURKEY Health Status in Turkey

According to the report **OECD Health Statistics 2014** How does Turkey compare?
In 2012

Income level on the average : 13.200 USD

77% of health spending was funded by public sources.

70 million GSM and 3G/4G subscriber

Total health spending accounted for 5.4% of GDP, well below the OECD average of 9.3%.

44 million : Social Security Institution (SGK)

1.8 doctor per 1000 population, and well below the OECD average of 3.2.

1.7 nurses per 1000 population, well below the OECD average of 8.8.

23 million diabetic illness

6 million people with cardio vascular disease

Next Step

(1), Government is willing to complete teleMonitoring network by the end of 2017 and establish remote patient monitoring portal/facilities as soon as possible.

which reduces to cost of medicine (about %30-40) and lightens the workload of hospitals and transportation as well.

(2), Private hospitals enjoys state funding's for the patient care as state hospitals but, no commitment for telemonitoring as state hospitals

(3) Positions of Telecom companies, Vodafone, Turkcell, Avea and TurkTelekom are unknown, but they are willing to get involved on remote patient monitoring

since their investments are on the broadband communications through 3G or 4G technologies.

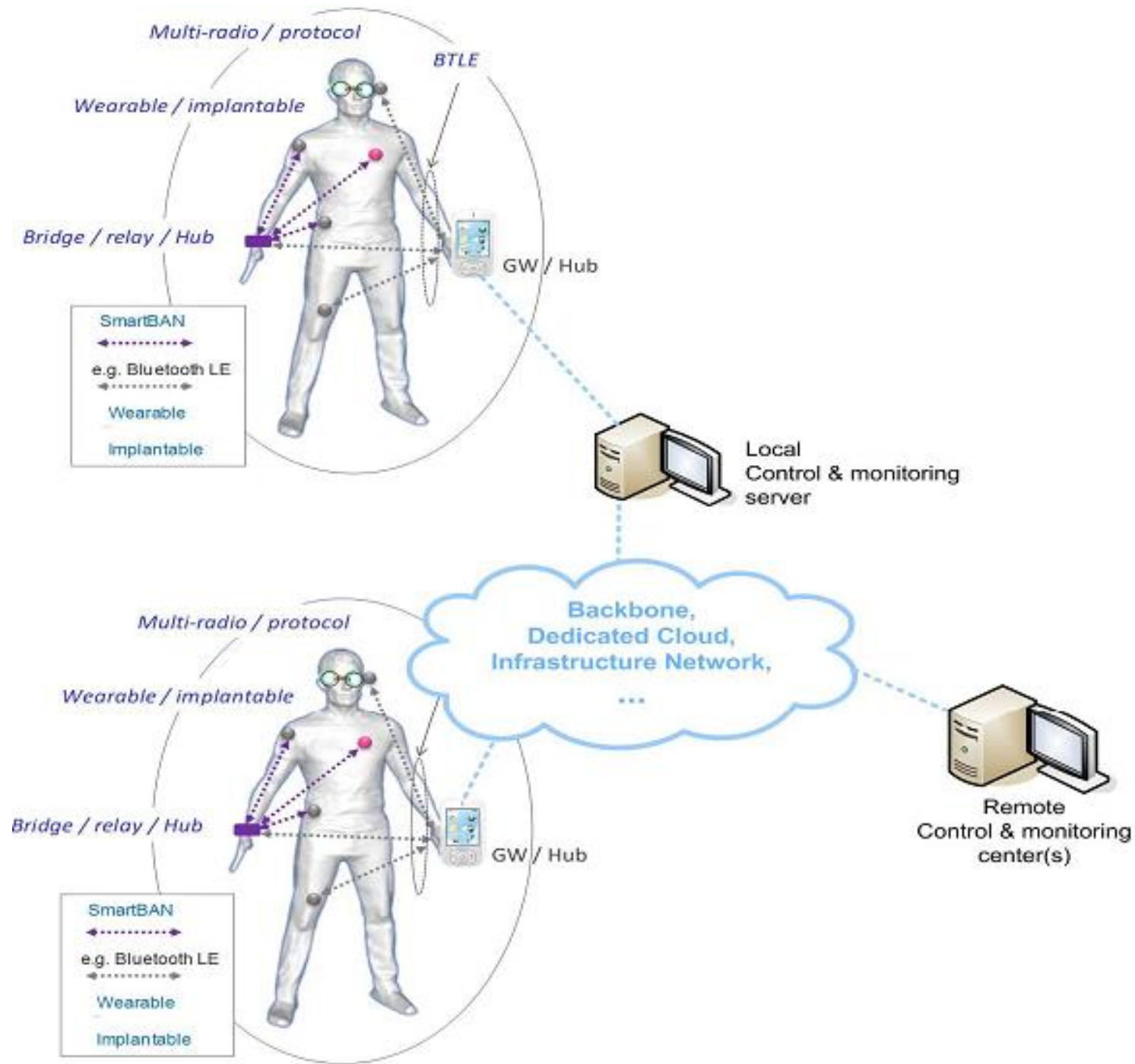
But here, a technology is required more flexible and RELIABLE interface with body sensors, i.e. BT, ZB etc.

Where Telecom companies needs to invest more on non-profitable technologies, i.e. BT ???

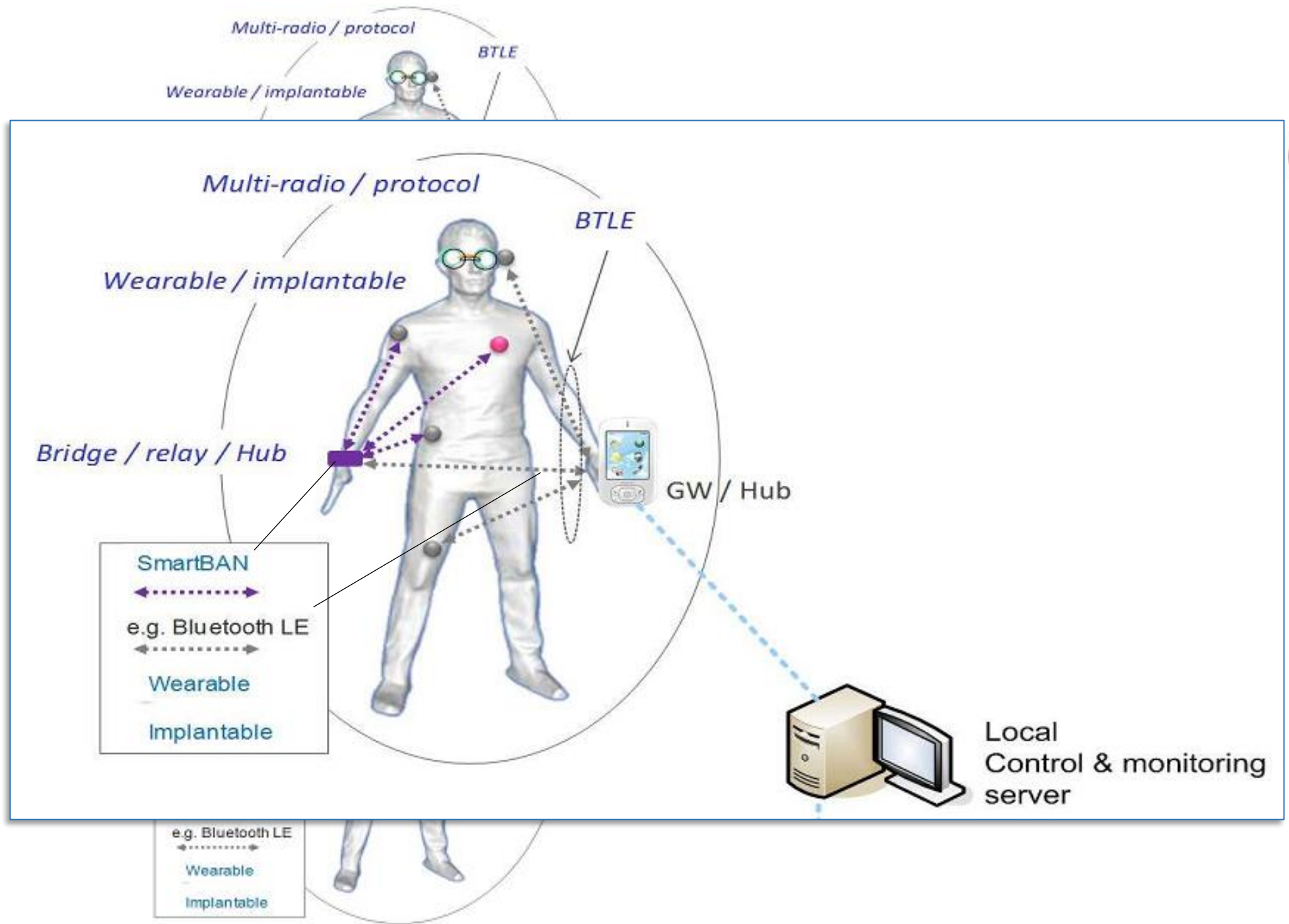
REMOTE PATIENT MONITORING: (1) Radio Technologies

| Radio | WIFI/WLAN | Bluetooth 1, BT 2.1, BT 4 | IEEE 802.15.4, ZigBee, Wireless Hart, CyFi | IEEE 802.15.6 SmartBAN/ETSI |
|------------------------|--------------------|---------------------------------|--|--------------------------------|
| Frequency Band (GHZ) | 2.4-2.485, 5.6-5.8 | 2.4-2.483 | 2.4-2.483 | 2.4-2.483 +2.36-2.4 |
| Emitted Power | 200 mW | 20 mW | 4 mW | 1 mW |
| Power Consumption (mW) | 1000 | 70 | 30 | ?, 13 |
| Data Rate (KB/s) | 54000 | 752-24000 | 250 | 600-1000 |
| Availibility | %90-100 | %70-90 | %1 | - |

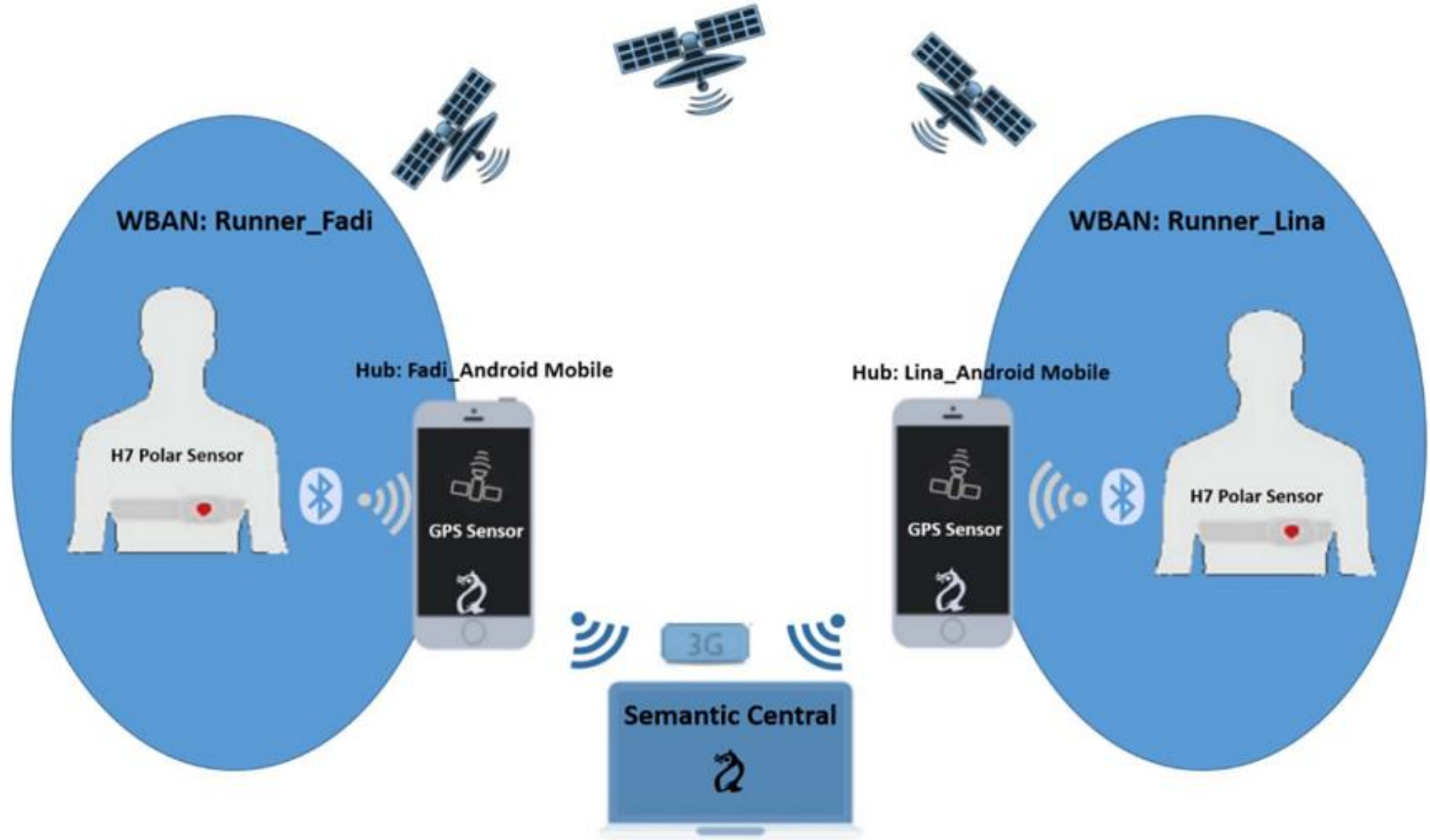
Remote Patient Monitoring: (2) ETSI view (SmartBAN)



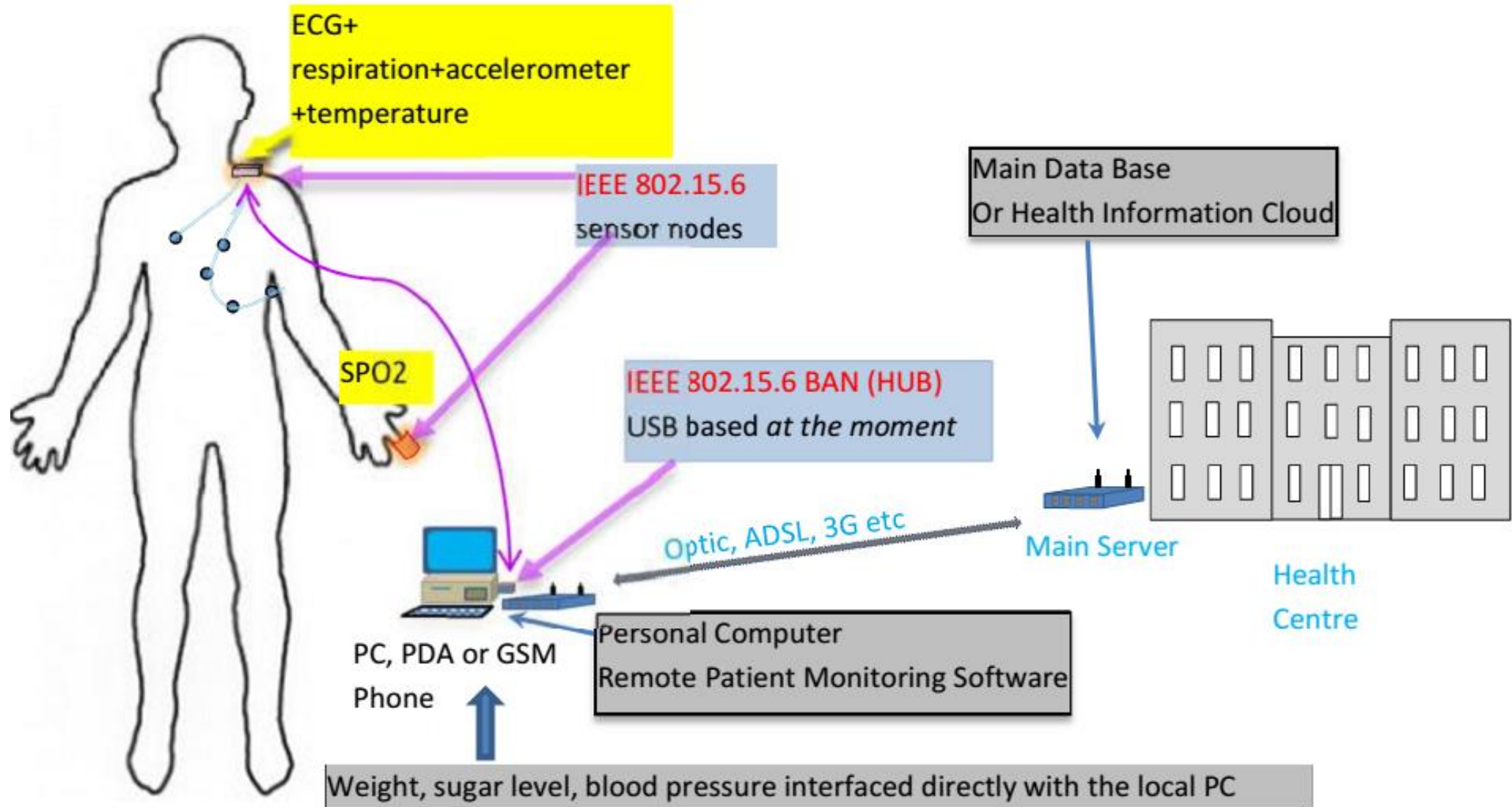
Remote Patient Monitoring: (3) ETSI view (SmartBAN)




Remote Patient Monitoring: (3) ETSI view (SmartBAN)



Remote Patient Monitoring : IEEE View (IEEE 802.15.6)



Remote Patient Monitoring : IEEE View (IEEE 802.15.6) Status of IEEE 802.15.6

1. Radio (transceiver) is not available. 
2. Communication protocol is implemented by only IMEC from HOLLAND but no hardware.
3. Our work is to implement IEEE 802.15.6 protocol stack using AT86RF233 which covers 2.36 to 2.83 GHz (However the data is spreaded using IEEE 802.15.4 DSSS technique).
4. Our expected performance is **less than %1 PER** using diversity which is around %6 percent for non diversity (like ZigBee with no diversity).
5. Implementation 400 kbits/s data, 8 m, 1 mW transmit power **12 mw of power consumption. (while ZigBee is 32 mw, BT is 60 mW)**
6. MAC layer protocol stack is **fully complaint with IEEE 802.15.6.**



CONCLUSIONS

For the telemonitoring in Turkey:

1. Government adapts state health services and hospitals to eNabız portal.
2. Universities and university hospitals are not willing to involve at the moment.
3. Private hospitals keep their own data independently *but in HL7 format*.

For the remote patient monitoring:

1. Work is required to standardize sampling statuses for sensors.
2. Work is required to implement really a low power radio.
3. Machine learning may well be implied big data as well as regional or personal data.



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Thank You

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