Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)

Submission Title: [WBAN Non-Medical Application]

Date Submitted: [January, 2007]

Source: [Shinsuke Hara(1), Ichirou Ida(2), Bin Zhen(1), Kamya Yazdandoost(1), Kenichi Takizawa(1), Tetsushi Ikegami(1), Huan-Bang Li(1) and Ryuji Kohno(1)]

Company [(1) National Institute of Information and Communications Technology (NICT), (2) Fujitsu Laboratory Ltd.]

Contact: Shinsuke Hara

Voice:[+81 46 847 5445, E-Mail: hara@nict.go.jp]

Abstract: [This document reviews the current implantable biomedical system.]

Purpose: [Potential technologies for BAN healthcare application.]

WBAN Non-Medical Application
- *E-Lucky Charm* -

S. Hara(1), I. Ida(2), B. Zhen(1), K. Yazdandoost(1), K. Takizawa(1), T. Ikegami(1), H.-B Li(1) and R. Kohno(1)

(1) National Institute of Information and Communications Technology (NICT)
(2) Fujitsu Laboratory Ltd.

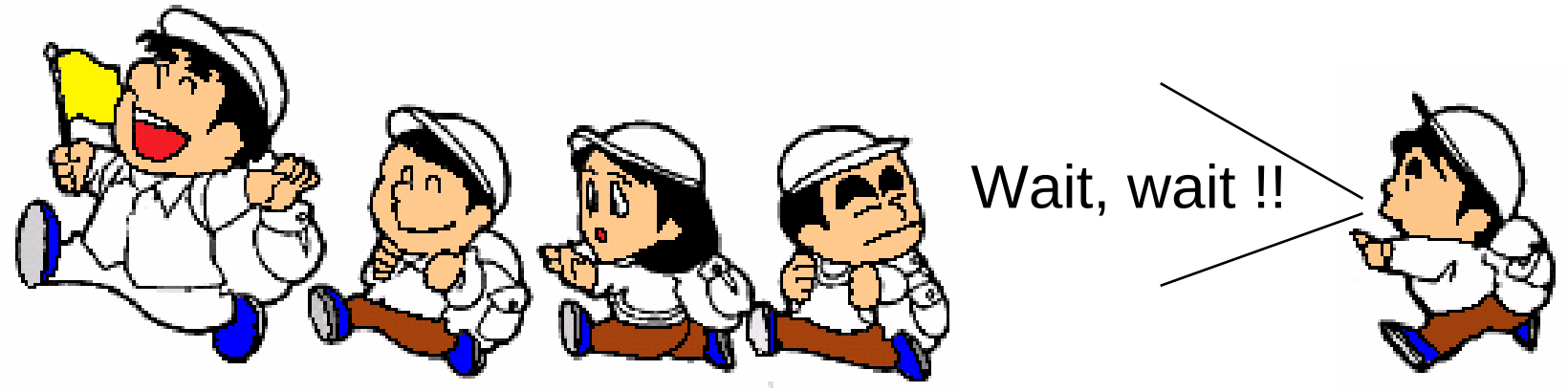
Motivation

- WBAN is important for not only medical but also ordinal (non-medical) applications
- Two non-medical applications are introduced to call this study group just “SG BAN”

Scenario 1: School Excursion

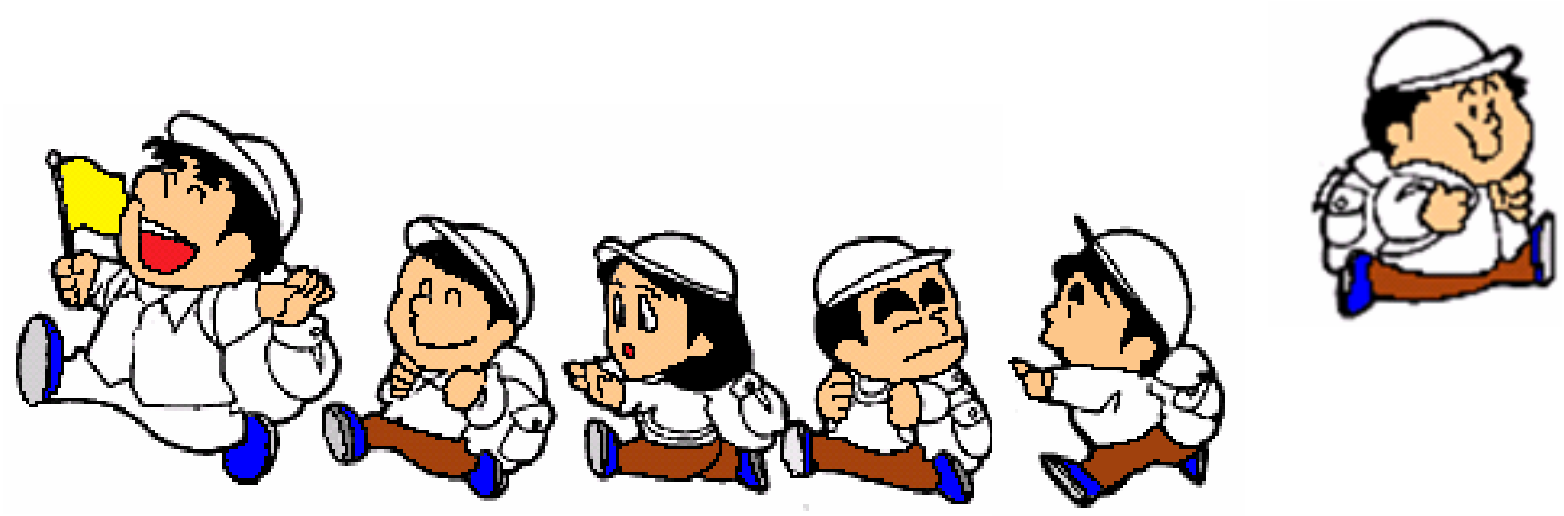
Teacher needs to be always careful about students' safety

Emergency (1/2)



- Some students may be not able to keep pace with other students

Emergency (2/2)



- Some students may lose their ways

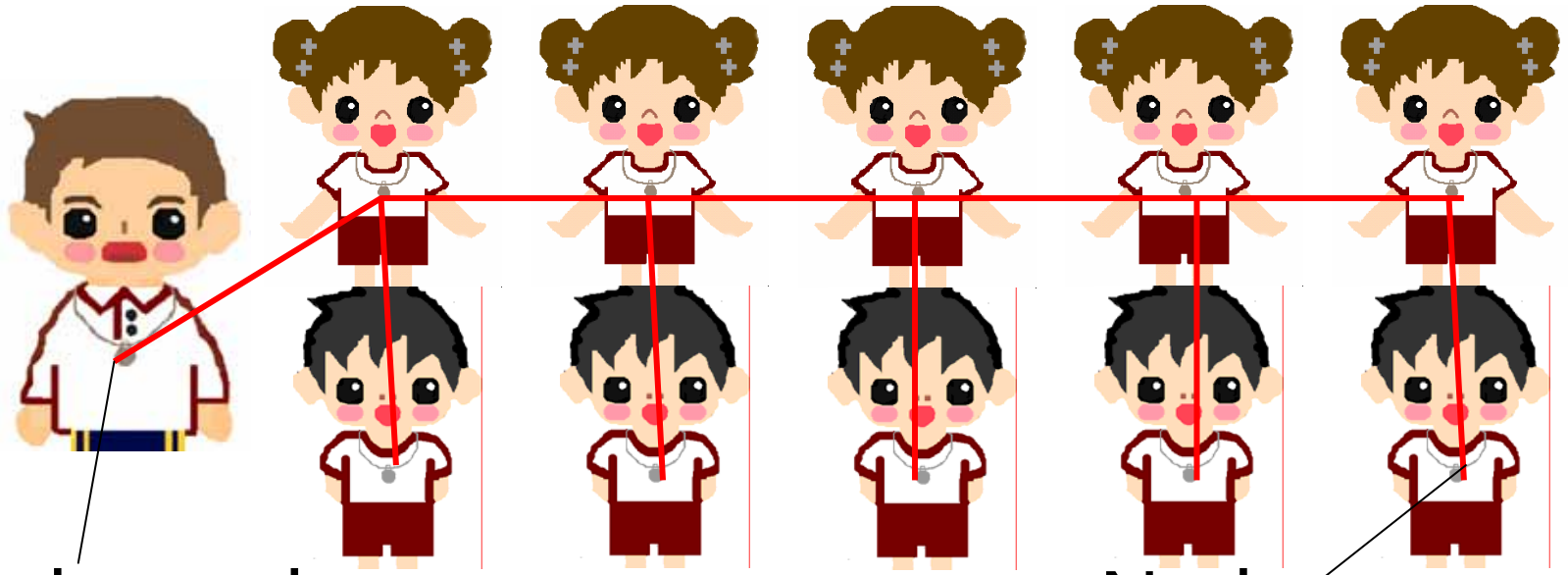
Teacher needs to notice the emergency as soon as possible, but he sometimes does not notice it quickly, because he needs to lead a lot of students (usually, 20-30 students)

E-Lucky Charm for Safe Excursion

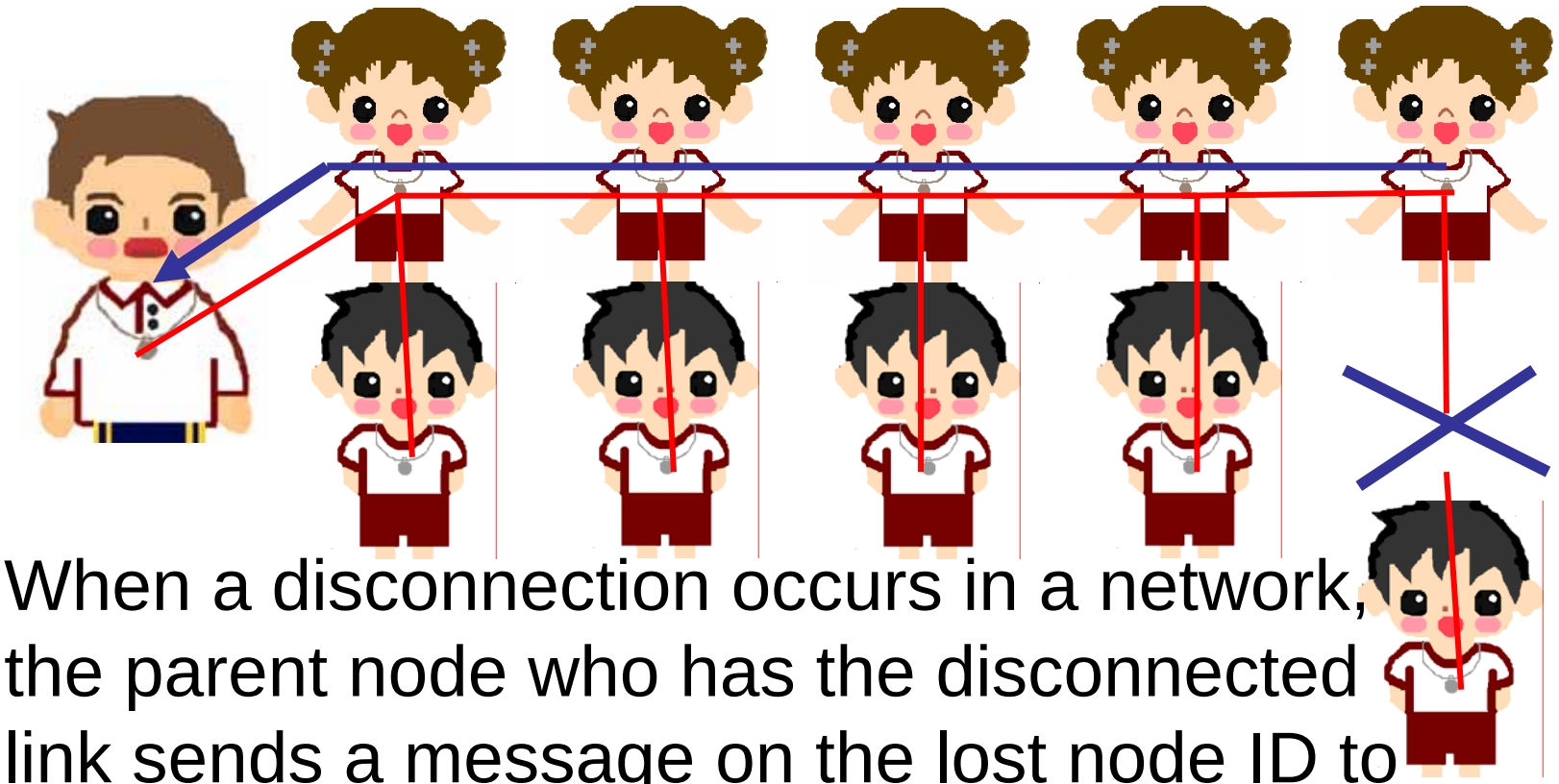
Teacher

Students

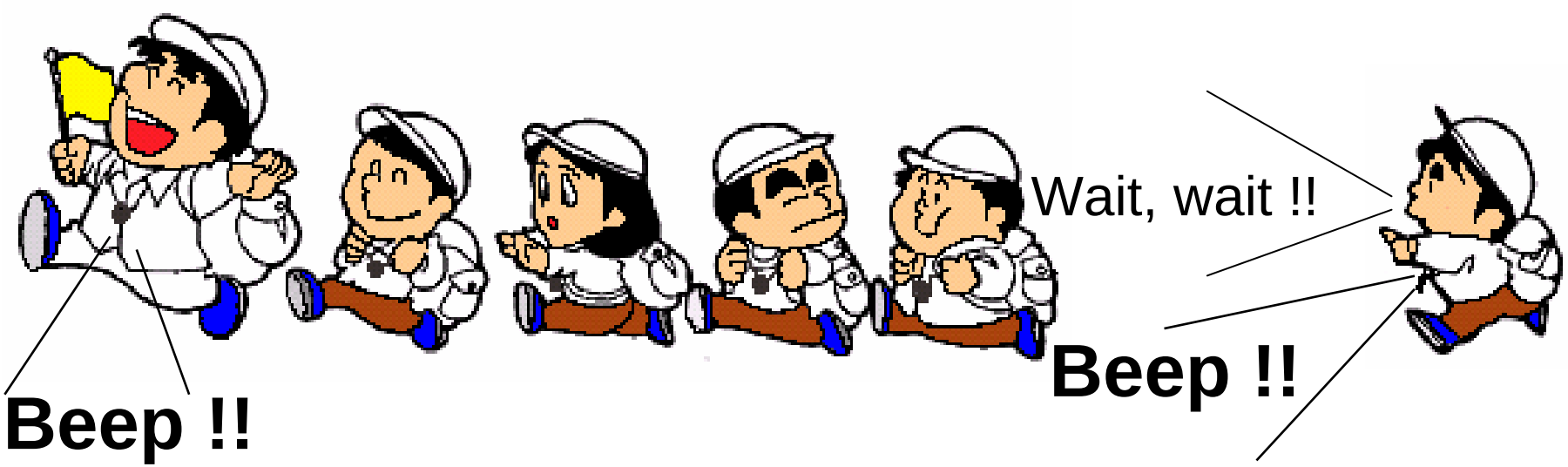
E-lucky charm with ad hoc networking capability



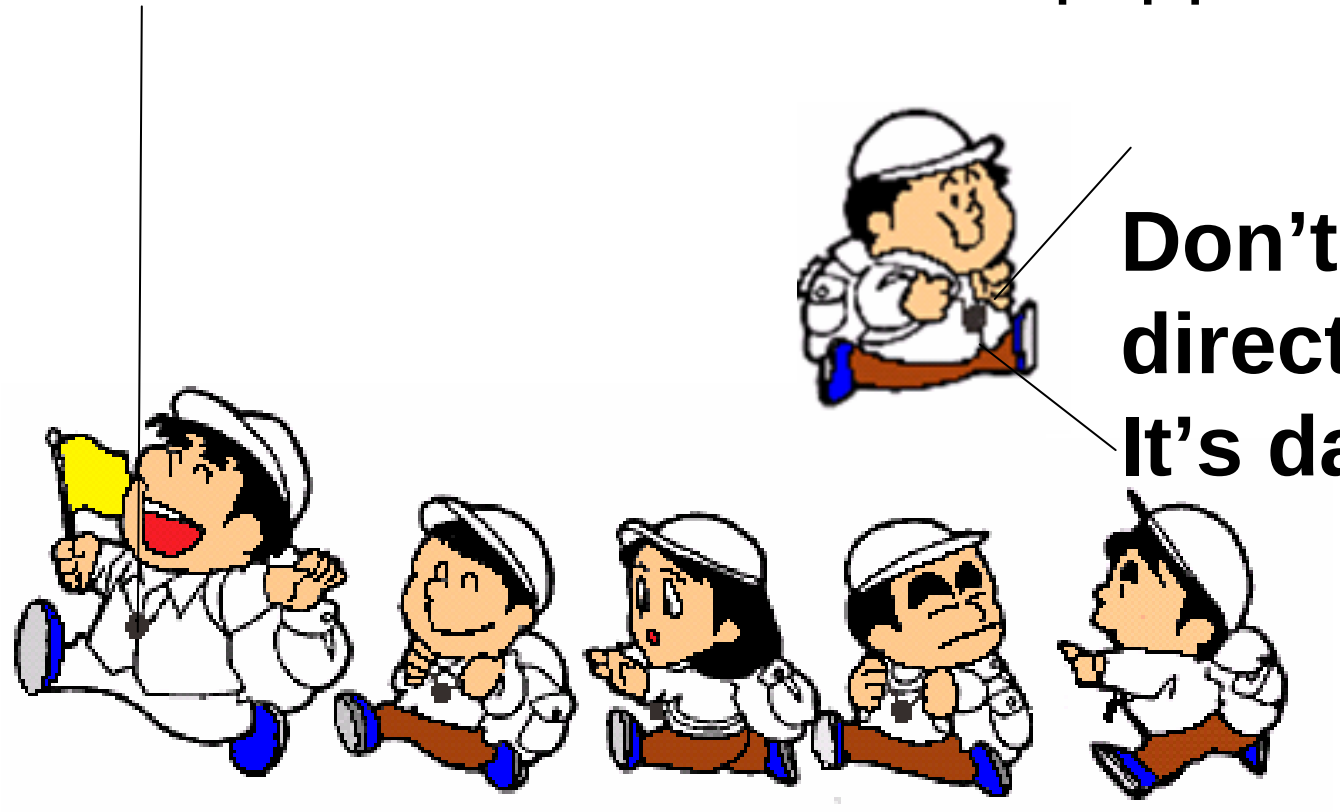
- Leader node memorizes network information such as network topology and all node IDs
- Each node memorizes its parent node ID and child node ID
- All nodes always keep communicating each other



- When a disconnection occurs in a network, the parent node who has the disconnected link sends a message on the lost node ID to the leader
- The emergency should be also notified to the leader in other methods such as sound


Wait, wait !!
Beep !!
Beep !!

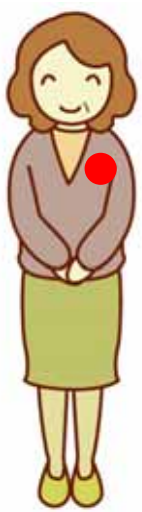
When the leader node is equipped with GPS



Don’t go to the direction, It’s dangerous!

- The network should be constructed within a human audible and visible range
- When a link disconnection is detected, it should be quickly notified to a leader

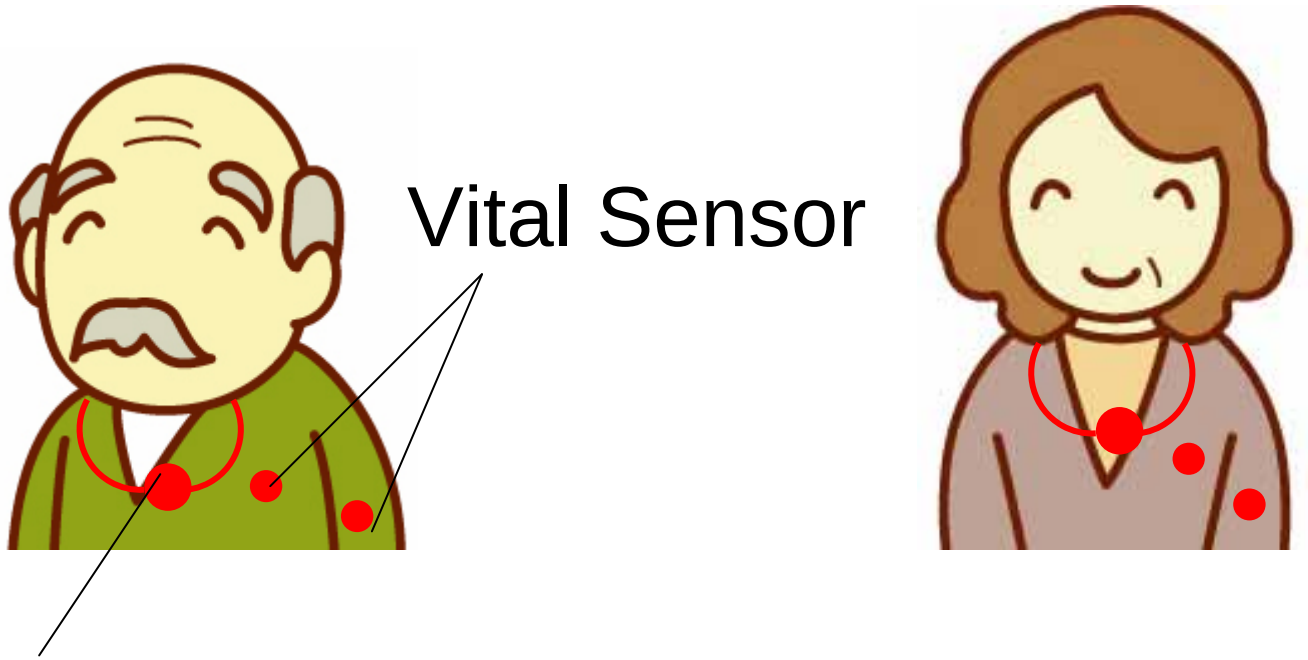
Scenario 2: Group Tour



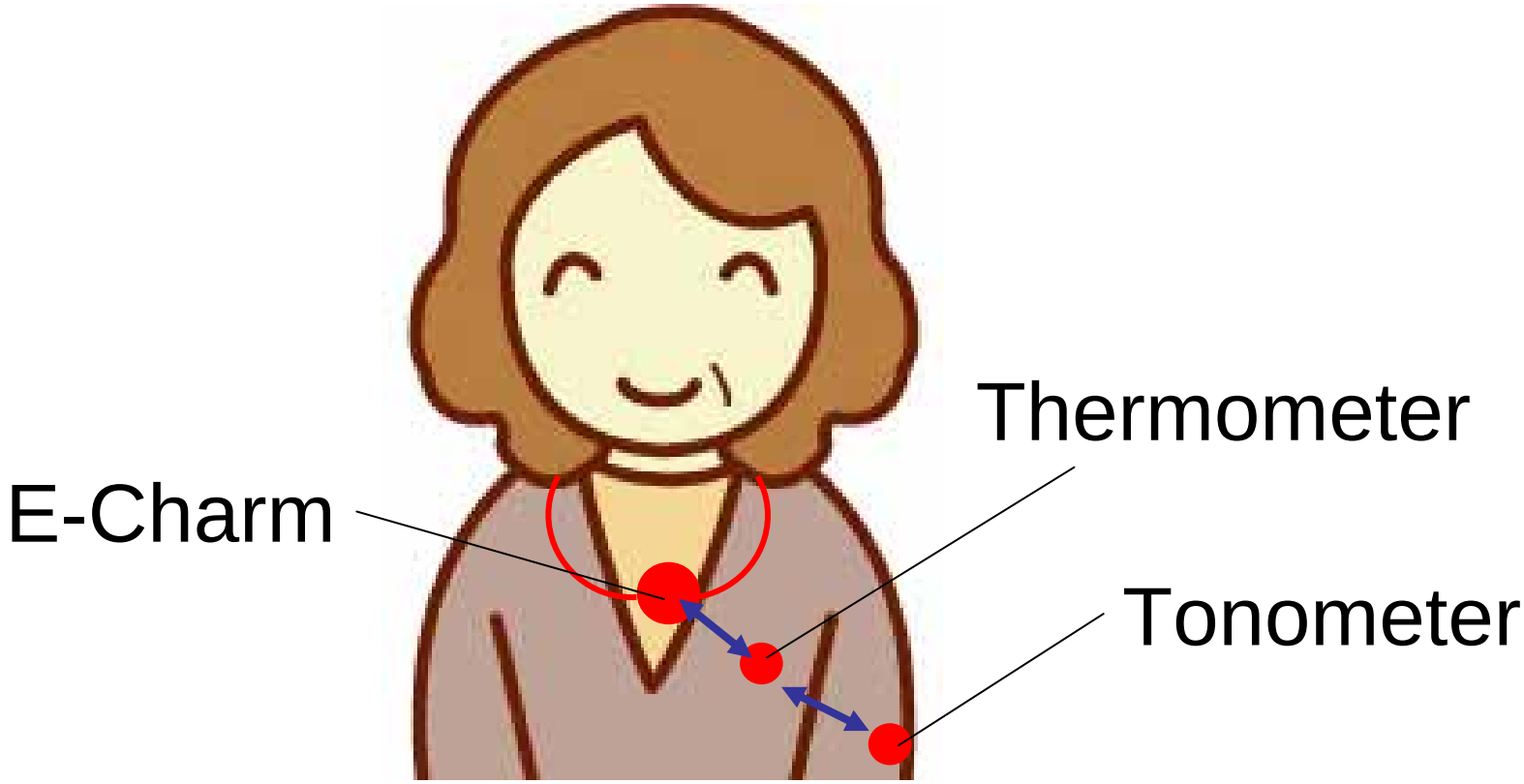
Tour conductor's tasks

- She needs to frequently call the role of participants in a tourist party when visiting a sight-seeing spot. When the number of participants is large, it sometimes takes a long time
- The number of elderly people is increasing in a tourist party. When a tourist party contains a lot of elderly people, she also needs to take care of their health

E-Lucky Charm for Safe Tour

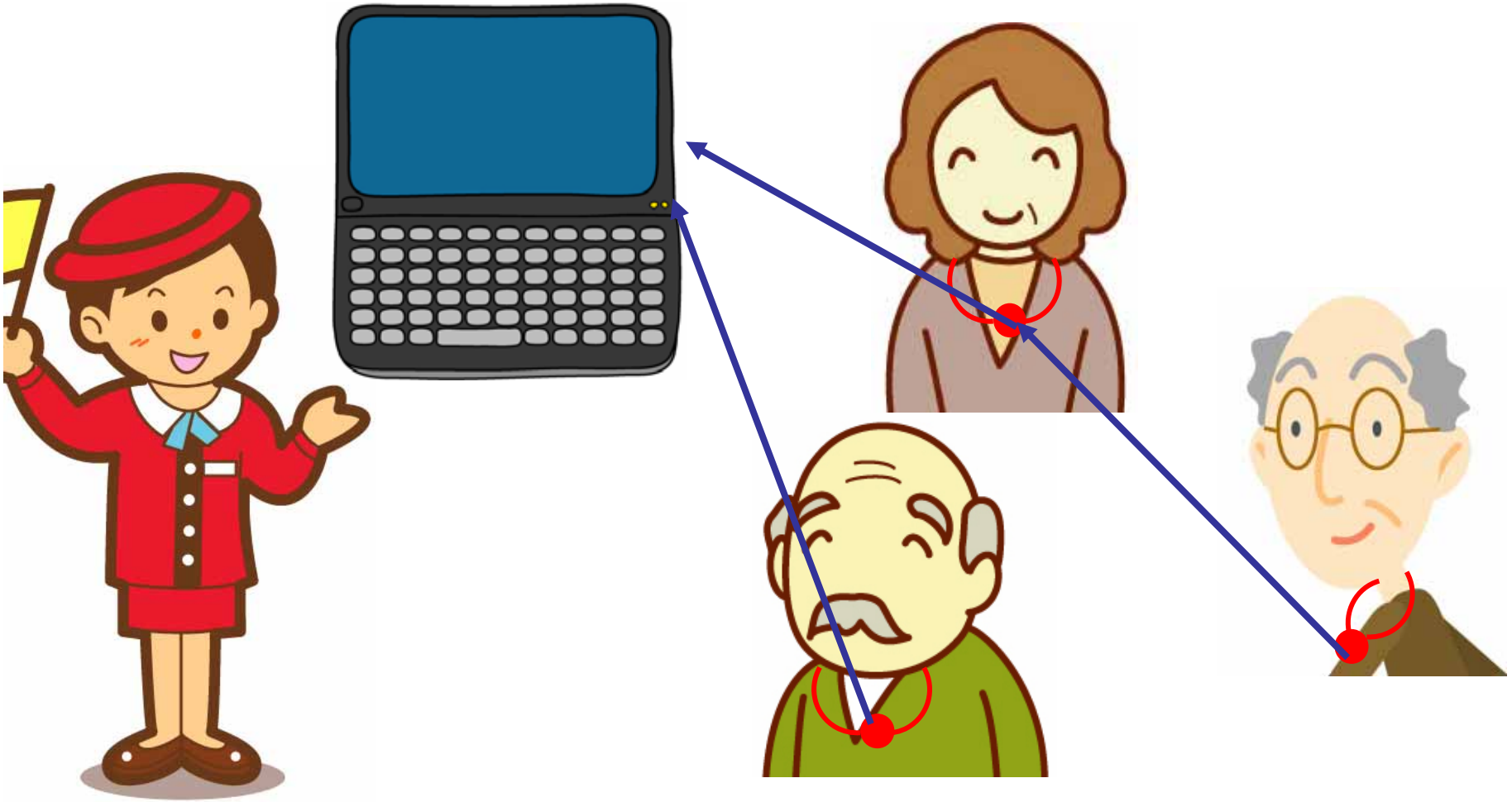


E-Charm with ad hoc networking capability and memory to store vital information

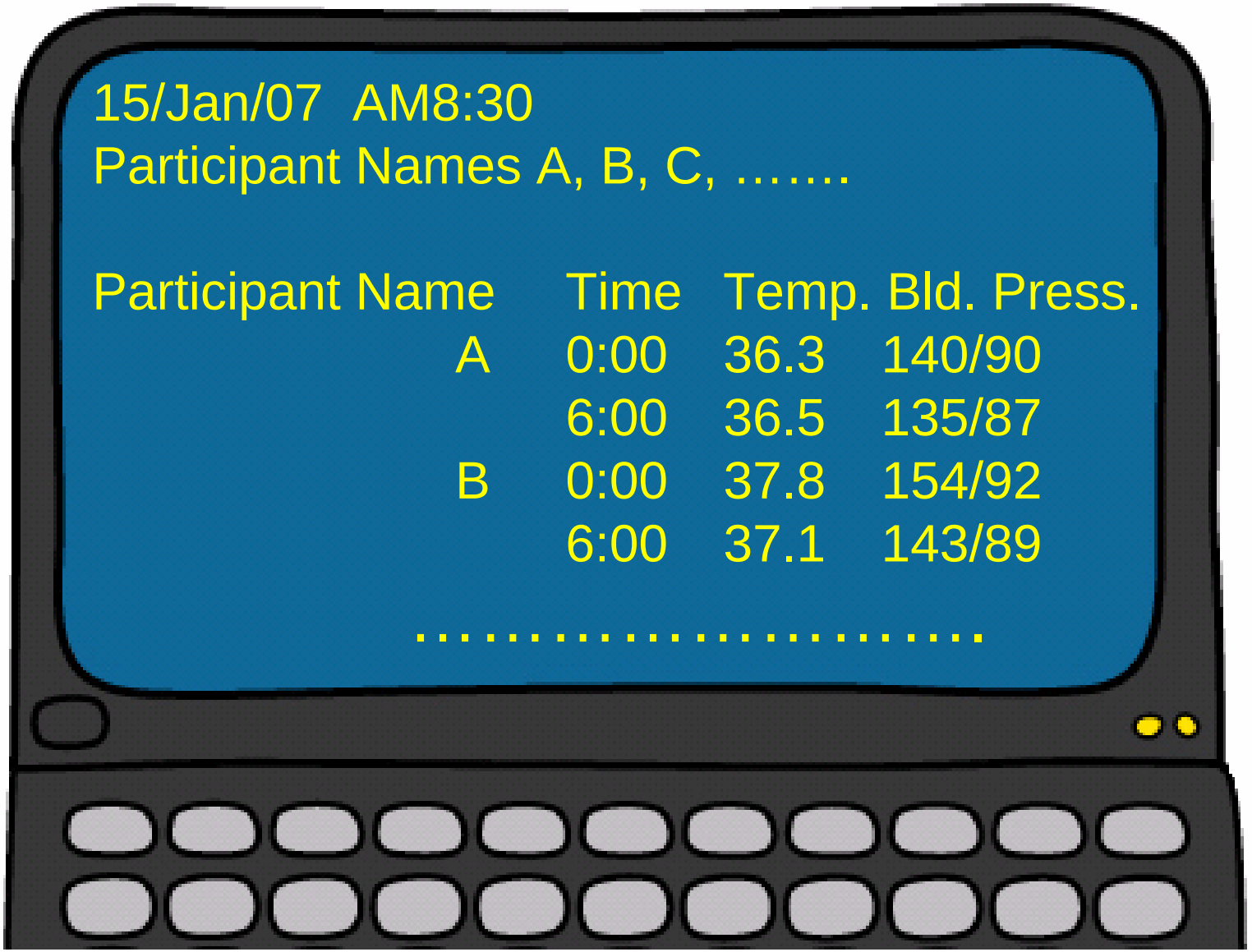


E-Charm periodically gathers information from vital sensors such as temperature and blood pressure several times a day and stores them

When participants gather in a localized place, a network is constructed in an ad hoc manner.



Tour conductor automatically call the role and gather information on participants' health.


15/Jan/07 AM8:30
Participant Names A, B, C, …….
Participant Name Time Temp. Bld. Press.
A 0:00 36.3 140/90
6:00 36.5 135/87
B 0:00 37.8 154/92
6:00 37.1 143/89
……

Why is WBAN standard suited for these “E-Lucky Charm”?

- The transmittable range up to 2-3 meters (up to 5 meters in outdoor environment) is desirable and enough for a network constructed within a human audible and visible range and quick detection of a link disconnection When a link disconnection is detected, it should be quickly notified to a leader
- The low data transmission rate up to several tens of kbps is required and enough to support this application
- WBAN is SAR (Specific Absorption Ratio)-conscious

Why is RF-ID ***not*** suited for these "E-Lucky Charm"?

- Multi-hop capability is required to support the application, but RF-ID does not have it

Why is WPAN standard ***not*** suited for these “E-Lucky Charm”?

- The transmittable range up to 10 meters by WPAN is too large for a network constructed within a human audible and visible range and quick detection of a link disconnection to a leader
- The transmittable range up to 2-3 meters can be achieved in WPAN by reducing the transmission power. But, the network will be vulnerable to co-channel interference from other WPANs
- E-charm is always in touch with human body, so SAR should be taken into consideration

Therefore, WBAN standard is only a solution to support these applications of “E-Lucky Charm”

What is WBAN?

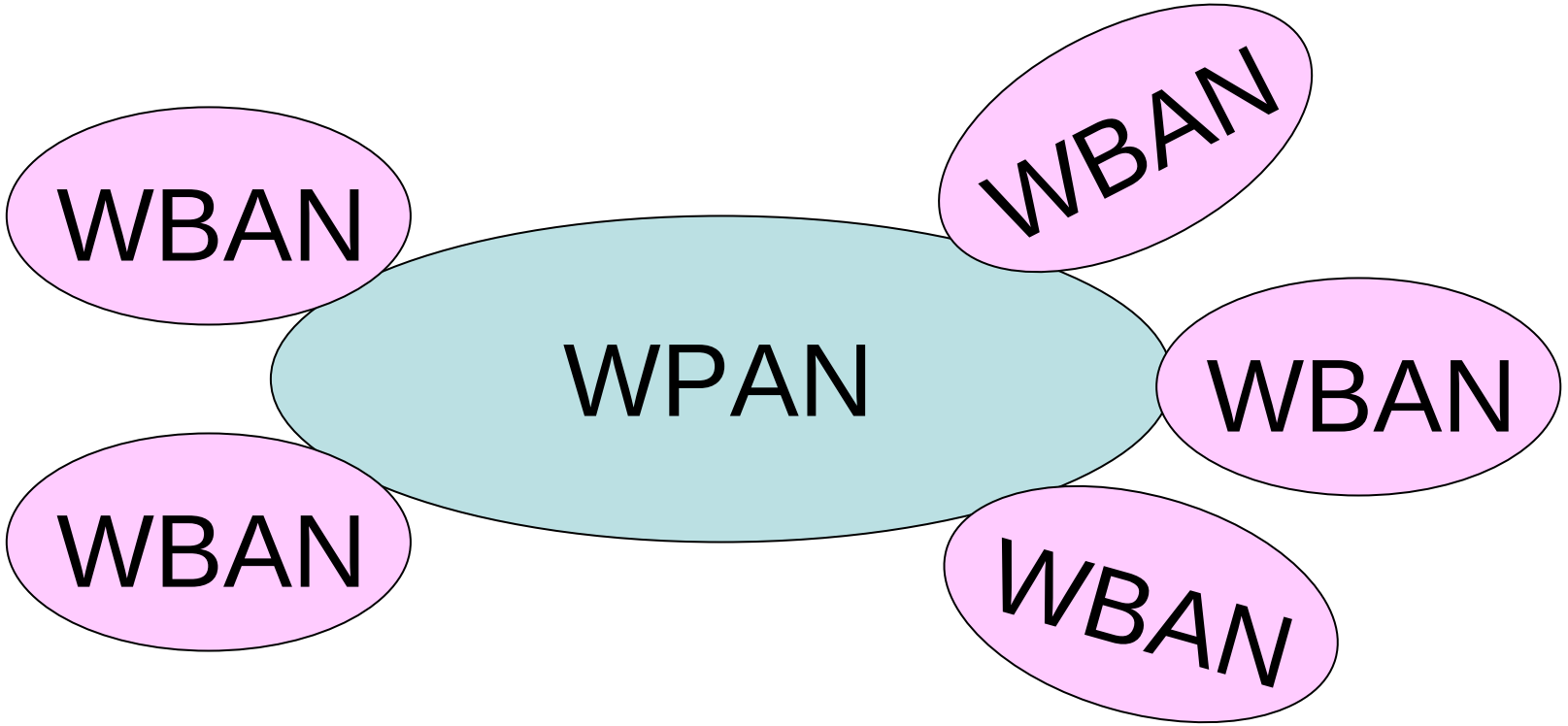
WBAN standard is a ***SAR-conscious*** PHY/MAC protocol suit with extremely *low* transmission power thus *small* transmittable range, taking into consideration putting devices directly on human body always or for a long time

Therefore, WBAN standard is essential for wearable wireless system where devices are in touch with human body for a long time

SAR-consciousness is the most distinguishable point of WBAN standard from other standards such as WMAN, WLAN and WPAN.

- Transmittable range is reducible in other standards
- Low transmission power is also achievable in other standards

WBAN enlarges the spectrum of applications by WPAN (WLAN)



Conclusions

- Two non-medical applications were introduced, which can be supported only by WBAN standard
- WBAN standard should be open for non-medical applications and non-medical frequency bands
- For instance, from the SAR and short transmittable point of view, the use of mm-wave is desirable