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Red Tacton an Innovative Human Area Networking Technology

Ms. Neetu Bansal,Assistant Professor,
Maharaja Agrasen Institute of Management Studies
&
Dr. Supreet Singh,Assistant Professor,
Delhi Institute of Rural Development

ABSTRACT

RedTacton is a new innovative Human Area Networking technology that turns the surface of the human body as a safe, high speed network transmission path. RedTacton takes a different technical approach. Instead of relying on electromagnetic waves or light waves to carry data, RedTacton uses weak electric fields on the surface of the body as a transmission medium. Using RedTacton, communication starts when terminals carried by the user or embedded in devices are linked in various combinations according to the user's natural, physical movements. Communication is possible using any body surfaces, such as the hands, fingers, arms, feet, face, legs or toes. RedTacton works through shoes and clothing as well. A transmission path is formed at the moment a part of the human body comes in contact with a RedTacton transceiver, physically separating ends the contact and thus ends communication. A RedTacton transmitter couples with extremely weak electric fields on the surface of the body. The weak electric fields pass through the body to a RedTacton receiver, where the weak electric fields affect the optical properties of an electro-optic crystal. The extent to which the optical properties are changed is detected by laser light which is then converted to an electrical signal by a detector circuit. NTT developed super sensitive Photonic electric field sensor for detecting minute electric field emitted on the surface of the human body. Instead of relying on electromagnetic waves or light waves to carry data, RedTacton uses weak electric fields on the surface of the body as a transmission medium. Using RedTacton, communication starts when terminals carried by the user or embedded in devices are linked in various combinations according to the user's natural, physical movements.

Communication is possible using any body surfaces, such as the hands, fingers, arms, feet, face, legs or toes. RedTacton works through shoes and clothing as well. A transmission path is formed at the moment a part of the human body comes in contact with a RedTacton transceiver, physically separating ends the contact and thus ends communication. A RedTacton transmitter couples with extremely weak electric fields on the surface of the body. The weak electric fields pass through the body to a RedTacton receiver, where the weak electric fields affect the optical properties of an electro-optic crystal. The extent to which the optical properties are changed is detected by laser light which is then converted to an electrical signal by a detector circuit. NTT developed super sensitive Photonic electric field sensor for detecting minute electric field emitted on the surface of the human body.

INTRODUCTION

Human society is entering an era of omnipresent computing, when networks are seamlessly interconnected and information is always accessible at our fingertips.

The practical implementation of omnipresent services requires three levels of connectivity:
• Wide Area Networks (WAN), typically via the Internet, to remotely connect all types of severs and terminals;
• Local Area Networks (LAN), typically via Ethernet or WiFi connectivity among all the information and communication appliances in offices and homes; and

• Human Area Networks (HAN) for connectivity to personal information, media and communication appliances within the much smaller sphere of ordinary daily activities-- the last one meter.
NTT's RedTacton is a break-through technology that, for the first time, enables reliable high-speed HAN.
Human Area Networking (HAN) is a technology that safely turns the surface of the human body into a data transmission path at speeds up to 10 Mbps between any two points on the body.
All those reported technologies had two limitations.
1. The operating range through the body was limited to a few tens of centimeters.
2. The top communication speed was only 40 bit/s!!

These limitations were overcome by NTT (**Nippon Telegraph and Telephone Corporation**) located in Tokyo, Japan by using photonic electric field sensors and finally came up with a human area networking technology called **'RedTacton'**
• RedTacton is a new innovative Human Area Networking technology that turns the surface of the human body as a safe, high speed network transmission path.
• RedTacton takes a different technical approach. Instead of relying on electromagnetic waves or light waves to carry data, RedTacton uses weak electric fields on the surface of the body as a transmission medium.
• Using RedTacton, communication sta rts when terminals carried by the user or embedded in devices are linked in various combinations according to the user's natural, physical movements.
• Communication is possible using any body surfaces, such as the hands, fingers, arms, feet, face, legs or toes. RedTacton works through shoes and clothing as well.
• Technically, it is completely distinct from wireless and infrared. A transmission path is formed at the moment a part of the human body comes in contact with a RedTacton transceiver, physically separating ends the contact and thus ends communication.
• A RedTacton transmitter couples with extremely weak electric fields on the surface of the body. The weak electric fields pass through the body to a
RedTacton receiver, where the weak electric fields affect the optical properties of an electro-optic crystal. The extent to which the optical properties are changed is detected by laser light which is then converted toan electrical signal by a detector circuit.
• The transmitter consists of a transmitter circuit that induces electric fields toward the body and a data sense circuit, which distinguishes transmitting and receiving modes by detecting both transmission and reception data and outputs control signals corresponding to the two modes to enable two-way communication.
• Implementation of receive-first half-duplex communication scheme that sends only after checking to make sure that there is no data to receive in order to avoid packet collisions
• RedTacton takes advantage of the long-overlooked electric field that surrounds the human body.

The electro-optic sensor has three key features:
It can measure electric fields from a device under test (DUT) without contacting it, which minimizes measurement disturbance.
Ultra wide-band measurement is possible.
It supports one-point contact measurement that is independent of the ground, Which is the most significant feature in the present context.
NTT utilized this third feature to fabricate an intrabody communication receiver
For its human area networking technology, which is called RedTacton
Meaning Of RedTacton?
TACTON: - "touch-act-on" Meaning "action triggered by touching".
RED: - It is an auspicious color according to Japanese culture.

OBJECTIVES: The aim of this document is to study its applications in various fields. Also It compares with various wirelesses and wired technologies and study its security related issues on the human body.

WHAT IS REDTACTON?

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and communication appliances within the much smaller sphere of ordinary daily activities-- the last one meter.

NTT's RedTacton is a break-through technology that, for the first time, enables reliable high-speed HAN.

Human Area Networking (HAN) is a technology that safely turns the surface of the human body into a data transmission path at speeds up to 10 Mbps between any two points on the body.

RedTacton is a Human Area Networking technology, which is under development, that uses the surface of the human body as a safe, high speed network transmission path. It is completely distinct from wireless and infrared technologies as it uses the minute electric field emitted on the surface of the human body A transmission path is formed at the moment a part of the human body comes in contact with a RedTacton transceiver. Communication is possible using any body surfaces, such as the hands, fingers, arms, feet, face, legs or torso. RedTacton works through shoes and clothing as well. When the physical contact gets separated, the communication is ended. Using RedTacton-enabled devices, music from a digital audio player in your pocket would pass through your clothing and shoot over your body to headphones in your ears. Instead of fiddling around with a cable to connect your digital camera to your computer, you could transfer pictures just by touching the PC while the camera is around your neck. And since data can pass from one body to another, you could also exchange electronic business cards by shaking hands, trade music files by dancing cheek to cheek, or swap phone numbers just by kissing.

Human society is entering an era of omnipresent computing, when networks are seamlessly interconnected and information is always accessible at our fingertips.

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Current problems with communication in body sensor networks

While wireless sensor networks are gradually becoming mainstream, the smaller related body sensor networks are still in their infancy. Body sensor networks consists of number of intercommunicating sensors that can be worn and that monitor the body. These devices communicate to each other and possibly send data to an o_ body location for further processing. While related to wireless sensor networks the challenges are deferent. Body sensor networks have to deal with more dynamic environment than wireless sensor nodes because humans rarely sit still. This causes problems with the

communication between the nodes with the radio techniques currently used. To overcome problems with transmission such as interference and disconnects the power of the transmission is increased [3]. This allows the signal to be received from a greater distance, leading to privacy concerns. Interference is a major problem with radio based technologies because most radio based techniques use frequencies that are near to each other and that are also used for other purposes like telephony [3] [4]. Because the signal strength is increased to minimize interference the power usage increases leading to batteries running out of power sooner. In table 3 the bandwidth requirements of multiple sensors are given, combining this with table 1 shows that it is feasible to build body sensor networks with radio today. But the energy usage of such a network is too large to keep such a network running without constantly needing to recharge the nodes. We are currently witnessing a growing interest in the area of wireless body area networking (WBAN) accompanied by the strong demand of the medical and healthcare society as well as by the advances in low-power micro- and nano-electronics and wireless networking. Consumers and doctors envisage an era where mobile health monitoring systems will work seamlessly and in concert to eliminate the lag time between the onset of symptoms and diagnosis. To this end WBAN can assert a key contribution, but as it shows particular characteristics when compared to traditional wireless sensor and ad hoc networks, it can introduce several new research challenges.

Previous work

Body coupled communications was discovered in the middle of the nineties. At MIT Zimmerman [5] discovered body coupled communications by accident while doing human interface research on position sensors. Simultaneously at the Sony Labs a similar technology was developed that resulted in the wearable key prototype [6]. These discoveries led to initial media frenzy. But soon afterwards interest was lost in body coupled communications because of what was then thought were fundamental limitations of the technology (Zimmerman thesis mistakenly stated that the technology had fundamental limit of 852 Kb/s). During the initial stages there was also research done at powering devices via the body. But this did not lead to much [2].

After a period of disinterest in the technology, between 2003- 2006 the technology regained some research interest. During this time di_erent techniques where tried and these managed to reach higher speeds. The first major breakthrough came from NTT (Nippon Telegraph and Telephone) in 2004. Using a electro optical implementation a speed of 10 Mb/s was reached. One of their applications was sending video through the body [7]. Around the same time the Skinplex technology became available which was very simple implementation with very low speeds and very low energy consumption [8]. This implementation was not advanced enough for body sensor networks and was mainly used for user identification. A few years later the SSL (Semiconductor System Lab) group from KAIST (Korea Advanced Institute of Science and Technology) was able to present a more power e_cient implementation of body coupled communications using wide-band signaling [1]. This implementation has been steadily improved with higher data rates and features like interference robustness.

The implementation of NTT is slowly moving towards commercialization. The first commercial implementation of their security technology is the NTT Firmo evaluation kit [9]. The implementation from KAIST is still in development in the lab and will probably be commercialized in the near future. At the moment it appears that about five research groups are actively pursuing body coupled communications. Two of those groups have working advanced implementations and the others are still experimenting with the basic parameters. Most advanced research into body coupled communications seems to be happening in Japan and Korea with Europe and the United States lagging behind.

How Red Tacton works?

Using a new super-sensitive photonic electric field sensor, Red Tacton can achieve duplex communication over the human body at a maximum speed of 10 mbps. The Red Tacton transmitter induces a weak electric field on the surface of the body. The Red Tacton receiver senses changes in the weak electric field on the surface of the body caused by the transmitter. Red Tacton relies upon the

principle that the optical properties of an electro-optic crystal can vary according to the changes of a weak electric field. Red Tacton detects changes in the optical properties of an electro-optic crystal using a laser and converts the result to an electrical signal in an optical receiver circuit. The transmitter sends data by inducing fluctuations in the minute electric field on the surface of the human body. Data is received using a photonic electric field sensor that combines an electro-optic crystal and a laser light to detect fluctuations in the minute electric field. The naturally occurring electric field induced on the surface of the human body dissipates into the earth. Therefore, this electric field is exceptionally faint and unstable. The photonic electric field sensor developed by NTT enables weak electric fields to be measured by detecting changes in the optical properties of an electro-optic crystal with a laser beam.

MECHANISM OF COMMUNICATION WITH REDTACTON

Data is received using a photonic electric field sensor that combines an electro- optic crystal and a laser light to detect fluctuations in the minute electric field.

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The photonic electric field sensor developed by NTT enables weak electric fields to be measured by detecting changes in the optical properties of an electro-optic crystal with a laser beam.

Transmission Steps

1. The Red Tacton transmitter induces a weak electric field on the surface of the body.
2. The Red Tacton receiver senses changes in the weak electric field on the surface of the body caused by the transmitter.
3. It relies on the principle that the optical properties of the electro-optic crystal varies according to the changes in the weak electric field.
4. It detects the changes in the optical properties of an electrooptic crystal using a laser beam and converts the result into an electrical signal in a detector circuit.

RED TACTON TRANSCEIVER

The block diagram of a Red Tacton Transceiver . The signal from the interface is sent to the data sense circuit and the transmitter circuit. The data sense circuit senses the signal and if the data is present it sends control signal to the transmitter which activates the transmitter circuit. The transmitter circuit varies the electric field on the surface of our body. This change in the electric field is detected by the electro-optic sensor. The output of the electrooptic sensor is given to the detector circuit, which in turn given to the interface of the receiving red tacton device.

FUNCTIONAL FEATURES

A) Touch:-

Communication With Just a Touch Or Step

Touching, gripping, sitting, walking, stepping and other human movements can be the triggers for unlocking or locking, starting or stopping equipment, or obtaining data. Using RedTacton, communication starts when terminals carried by the user or embedded in devices are linked in various combinations through physical contact according to the human's natural movements.

b) Broadband & Interactive:-

Duplex, interactive communication is possible at a maximum speed of 10Mbps. Because the transmission path is on the surface of the body, transmission speed does not deteriorate in congested areas where many people are communicating at the same time. Taking advantage of this speed, device drivers can be downloaded instantly and execute programs can be sent.

c)AnyMedia:-

In addition to the human body, various conductors and dielectrics can be used as transmission media. Conductors and dielectrics may also be used in combination.

 A communication environment can be created easily and at low-cost by using items close at hand, such as desks, walls, and metal objects. But there is one limitation on the length of the conductor to be propagated, on installation locations, and on the thickness of the dielectric to be passed through.

A communications path can be created with a simple touch, automatically initiating the flow of data between a body-centric electronic device and a computer that is embedded in the environment. For example, two people equipped with RedTacton devices could exchange data just by shaking hands.

A wide range of natural human actions grasping, sitting down, walking, or standing in a particular place can be used to trigger RedTacton to start a networked process.Using a RedTacton electro-optic sensor, two-way communication is supported between any two points on the body at a throughput of up to 10 Mbps.

Communication is not just confined to the surface of the body, but can travel through the user's clothing to a RedTacton device in a pocket or through shoes to communicate with a RedTacton device embedded in the floor. Unlike wireless technologies, the transmission speed does not deteriorate even in the presence of large crowds of people all communicating at the same time in meeting rooms, auditoriums or stores. Because the body surface is the transmission path, increasing the number of connected users directly increases the available number of individual channels. RedTacton can utilize a wide range of materials as a transmission medium, as long as the material is conductive and dielectric, which includes water and other liquids, various metals, certain plastics, glass, etc.

Using ordinary structures such as tables and walls that are familiar and readily available, one could easily construct a seamless communication environment at very low cost using Red Tacton. (Note that constraints are imposed by the length and environment of the propagating conductor, and by the thickness of the dielectric.

Human Safety

NO current flows into human body from RedTacton devices. RedTacton uses the Electric field that occurs naturally on the surface of the human body for Communication. Transmitter and receiver electrodes are covered with an Insulating films. RedTacton is in conformity to the "Radiofrequency-exposure Protection" standard (RCR STD-38)" issued by the Association of Radio Industries and Businesses (ARIB).

We investigated the effects of Red Tacton technology on human health, which is obviously an important issue. First as shown in figure on the previous page, the transmitting and receiving electrodes of the Red Tacton receiver are completely covered with insulating film, so the body of the person acting as a transmission medium is completely insulated. This makes it possible for current to flow into a person's body from a transceiver. When communication occurs, displacement current is generated by the electrons in the body because the body is subjected to minute electrical fields. However such displacement currents are very common everyday occurrences to which we are all subjected. Red Tacton conforms to the "Radio Frequency- Exposure Protection Standard (RCR STD-38)" [6] issued by the association of Radio industries and business. The levels produced by Red Tacton are well below the safety limit specified by this standard.

RedTacton is a new Human Area Networking technology that uses the surface of the human body as a safe, high speed network transmission path. RedTacton uses the minute electric field emitted on the surface of the human body. Technically, it is completely distinct from wireless and infrared. A transmission path is formed at the moment a part of the human body comes in contact with a RedTacton transceiver. Physically separating ends the contact and thus ends communication. Using RedTacton, communication starts when terminals carried by the user or embedded in devices are linked in various combinations according to the user's natural, physical movements. Communication is possible using any body surfaces, such as the hands, fingers, arms, feet, face, legs or torso. RedTacton works through shoes and clothing as well.

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A communications path can be created with a simple touch, automatically initiating the flow of data between a body-centric electronic device and a computer that is embedded in the environment. For example, two people equipped with RedTacton devices could exchange data just by shaking hands. A wide range of natural human actions -- grasping, sitting down, walking, or standing in a particular place -- can be used to trigger RedTacton to start a networked process.
Using a RedTacton electro-optic sensor, two-way communication is supported between any two points on the body at a throughput of up to 10 Mbps. Communication is not just confined to the surface of the body, but can travel through the user's clothing to a RedTacton device in a pocket or through shoes to communicate with a RedTacton device embedded in the floor.
RedTacton can utilize a wide range of materials as a transmission medium, as long as the material is conductive and dielectric, which includes water and other liquids, various metals, certain plastics, glass, etc

FEATURES OF RED

RedTacton has three main functional features:-

1. Touching, gripping, sitting, walking, stepping and other human movements can be the triggers for unlocking or locking, starting or stopping equipment, or obtaining data.

2. Bandwidth does not deteriorate even with duplex operations and simultaneous access by many users. Duplex, interactive communication is possible speed of 10Mbps. Because the transmission path is on the surface of the body, transmission speed does not deteriorate in congested areas where many people are communicating at the same time. Maximum communication speed may be slower than 1 environment.

3. RedTacton can utilize a wide range of materials as a transmission medium, as long as the material is conductive and dielectric, which includes water and other liquids, various metals, certain plastics, glass, etc. Conductors and dielectrics may also be used in combination.

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Applications of Red Tacton

There are many applications of red tacton in different fields. This technology will widely used in daily working schedule and provide convenience to people [5].

One–To–One Services

1. An Alarm

Red Tacton devices embedded medicine bottles transmit information on the medicines attributes. If the user touches the wrong medicine, an alarm will trigger on the terminal he is carrying the alarm sounds only if the user actually touches the medicine bottle, reducing false alarms common with passive wireless ID tags, which can trigger simply by proximity.

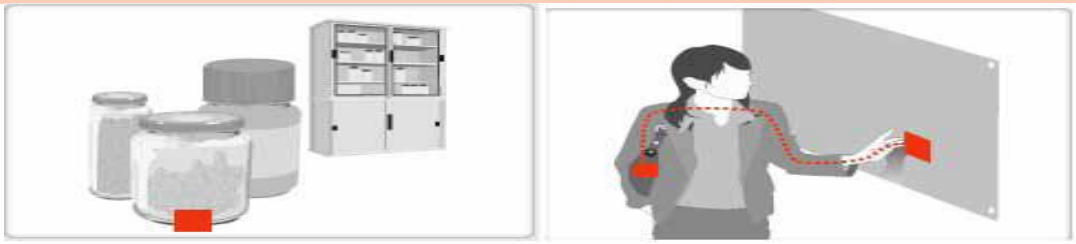

Fig. 4: One-To-One Services

Fig. 4 shows an alarm sounds automatically to avoid accidental medicine ingestion in the first application on the left side of fig. Right part of fig. 4 describes touch advertising and receive Information.

2. Touch Advertising

When a consumer stands in front of an advertising panel and information matching his or her attributes is automatically displayed. By touching or standing in front of items, consumers can get more in-depth information. When a consumer stands in front of an advertising panel and information matching his or her attributes is automatically displayed. By touching or standing in front of items, consumers can get more in-depth information

Intuitive Operation

1. Touch a printer to print

Print out where you want just by touching the desired printer with one hand and a PC or digital camera with the other hand to make the link Complicated configurations are reduced by downloading device drivers "at first touch" Instant private data exchange

By shaking hands, personal profile data can be exchanged between mobile terminals on the users. (Electronic exchange of business cards) Communication can be kept private using authentication and encryption technologies.

Personalization

There are many applications under personalization.

Just Touching a phone makes it your own

Your own phone number is allocated and billing commences. Automatic importing of personal address book and call history.

1. Personalisation of Automobiles

The seat position and steering wheel height adjust to match the driver just by sitting in the car [6]. The driver's home is set as the destination in the car navigation system. The stereo plays the driver's favorite song.

2. Wireless Headset

Red Tacton can carry music or video between headsets, mobile devices, mobile phones, etc. Users can listen to music from a Red Tacton player simply by putting on a headset or holding a viewer.

3. Conference System

An electrically conductive sheet is embedded in the table. A network connection is initiated simply by placing a lap-top on the table. Using different sheet patterns enables segmentation of the table into subnets.

Security Applications

Red Tacton is very secure in all respects such as authenticity, authorization and verification as well as unlocking.

1. User verification and unlocking with just a touch

Carrying a mobile Red Tacton capable device in one's pocket, ID is verified and the door unlocked when the user holds the doorknob normally. Secure lock administration is possible by combining personal verification tools such as fingerprint ID or other biometric in the mobile terminal.

2. Automatic access log:

There is also a facility to access automatic log for confidential document storage. These access logs contain database information in the form of log files.

Other Applications

Red Tacton has many applications. So, it is not easy to explore all the applications.

1. Under Water Communication

Red Tacton allows communication in outer space and in water where the speech constraints are very high and thus enables a highly efficient means of expression of speech which is beyond the purvey of human beings.

2. Communication inside body

Red Tacton is also used for the treatment. In human body, it is used to detect ailments such as abnormal growths, tumors and excrescences affected tissues and thus helps in curing different diseases.

Any media

RedTacton can utilize a wide range of materials as a transmission medium, as long as the material is conductive and dielectric, which includes water and other liquids, various metals, certain plastics, glass, etc. Conductors and dielectrics may also be used in combination.

Comparison with Other Networks

The positioning of Red Tacton with respect to existing communication technologies. The focus on ubiquitous service has brought about the shortening of distances in communication. Red Tacton is positioned as the last 1m solution to ultimate close-range communication. Wireless communication creates connections when signals arrive, allowing for easy connections because connectors are unnecessary. However, seen from another aspect, the arriving signals can be intercepted, so security becomes an issue. Several "human body communication" technologies using the human body as a transmission medium have been reported in the past.

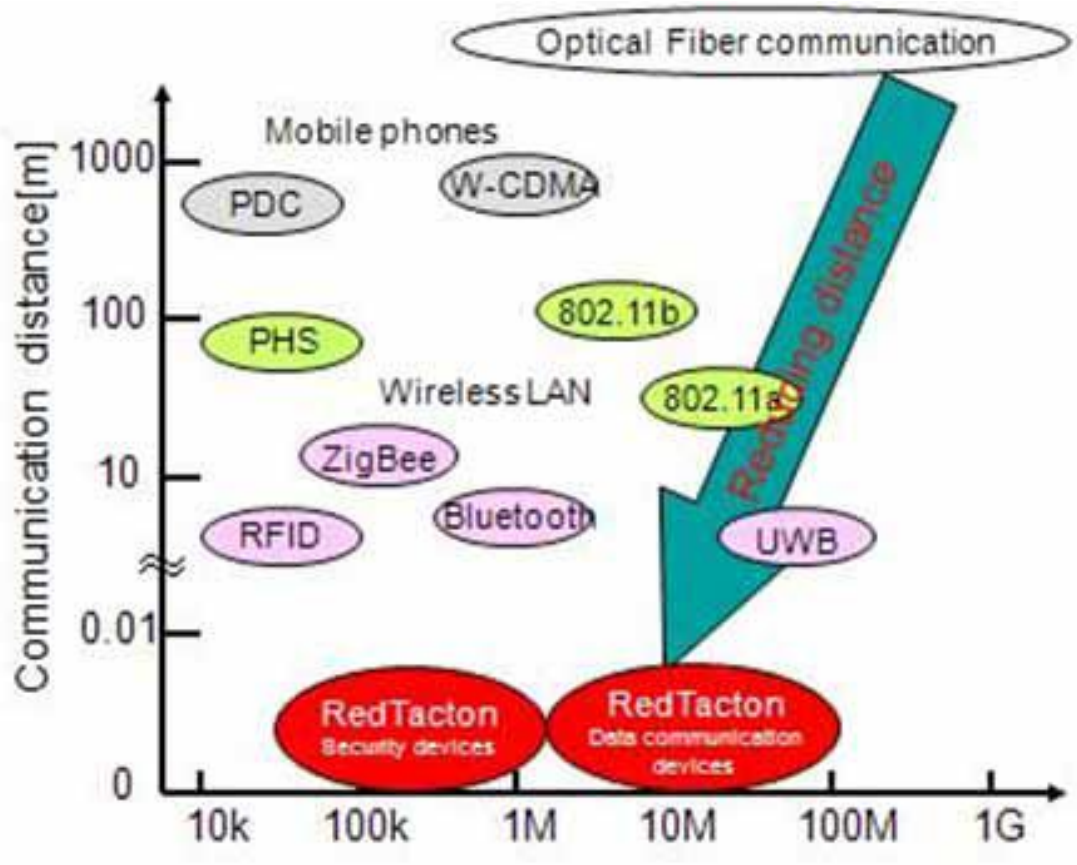

Fig. 11: Comparison with other networks [6].

But Red Tacton employs a proprietary electric field/photonics method, which surpasses the other methods in terms of communication distance, transfer speed, and interactivity.

We have discussed about various **infrared** and **Bluetooth wireless technologies** in our recent posts. But the technology has been advanced that these technologies have been overrated. Now, researchers are trying to develop a new path for transmission of signals called Human Area Networking. As the name indicates, such a technology will have the human body surface to transmit and receive signals at very high speeds. Now we are going to discuss such a technology, which is currently under development, called RedTacton Technology.

According o science studies, we know that our body is creating minute electric charges all the time. This electric field thus created is used for RedTacton technology to transmit and receive [duplex communication] the signals. Thus, this method is completely different from other signal transmitting technologies like wireless and infrared. Thus, like LAN and WAN, a new network protocol called HAN [Human Area Network], is being configured.

RedTacton actually is helpful in short distance communication. When compared with a wi-fi communication, this technology seems advantageous. In wi-fi, there is no need of any physical connections. Thus communication is established as soon as the signals arrive. But, when it comes to security reasons, wi-fi is a problem. As the signals can be easily hacked by others, extra security measures have to be included.

Also, when compared with wired transmission, RedTacton is more advantageous. Here physical connection is required at a high rate for data transmission. With more and more users trying to retrieve data from a single source, the physical connections become a problem. But, there will not be many problems with security.

So, we can confirm that RedTacton technology comes right in between wireless and wired connection. It can provide maximum security as well as data transfer without the use of physical connections. The security will be maximum as the data transfers can occur only between two contact points. Take a look at the figure below to know the exact comparison between all the technologies.

ADVANTAGE OVER BLUETOOTH

The system envisioned by NTT, utilizes a conversion method which takes digital data into a stream of low-power digital pulses. These can be easily transmitted and read back through the human electric field. While it is true that similar personal area networks are already accessible by using radio-based technologies like Wi-Fi or Bluetooth, this new wireless technology claims to be able to send data over the human skin surface at transfer speeds of up to 10Mbps, or better than a broadband T1 connection. Receiving data in such a system is more complicated because the strength of the pulses sent through the electric field is so low. RedTacton solves this issue by utilizing a technique called electric field photonics: A laser is passed though an electro-optic crystal, which deflects light differently according to the strength of the field across it. These deflections are measured and converted back into electrical signals to retrieve the transmitted data. According to Tom Zimmerman, inventor of the IBM personal networking system, body-based networking is more secure than broadcast systems such as Bluetooth, which have a range of about 10m.The issue is that with Bluetooth, it is difficult to rein in the signal and restrict it to the device you are trying to connect to. But in a busy place there could be hundreds of Bluetooth devices within range.

Moreover, body-based networking seems to allow for more natural interchanges of information between humans, as only when you are in true proximity you can make this system work. There are some specific applications that would appear as being ideal matches for RedTacton-like technologies. While RedTacton may be a superior technology, adoption could be slow since Bluetooth and other radio technologies are already entrenched. Like those products, RedTacton will become more valuable as it is adopted. If there is nothing for a person's RedTacton device to talk to, it is essentially useless. Also, initially, it will be comparatively expensive. If security applications take off, particularly in the military field, it maybe years before the technology become available to consumers. It does, however, have to potential to disrupt the Bluetooth market, since it is more secure and works at much higher speeds. On the medical side, however, it may create a new market. As far as security applications are

concerned, it could be disruptive because it is such a secure way to communicate. Radio swipe cards are much easier to manipulate than a RedTacton human swipe card. Again, the biggest hurdle will be convincing consumers that the product is worth the premium that will be charged because it seems, on the surface, to be so similar to technologies that are already available. Explaining why it is more secure and more efficient could be a challenge. Management will need to seriously consider how it will be marketed and hire excellent marketing people to promote the product.

Prototypes

A prototype is an early sample or model built to test a concept or process or to act as a thing to be replicated or learned from.

NTT has made three types of prototypes:

1) **PC Card Transceiver (PC Card type)**

PC Card was originally designed for computer storage expansion, but the existence of a usable general standard for notebook peripherals led to many kinds of devices being made available in this form. Typical devices included network cards, modems, and hard disks. In Red Tacton, we can use PC Card Transceiver having both the capabilities to transmit and receive of communication speed of 10Mbps and communication method used in this is Half-duplex. TCP/IP protocol suite is used in the transceiver and interface is PCMCIA which was developed by Personal Computer Memory Card International Association.

An add-in integrated circuit card that conforms to specifications developed and promoted by the Personal Computer Memory Card International Association (PCMCIA). PC cards are approximately the length (86.5 mm) and width (54 mm) of a credit card, but Switch CPU Power Supply Central Office Switch Line Interfaces **PBX** MDF Host Interface AP demarc Data Network PBX Tie Trunk CO Trunk much thicker, and fit into a slot built into a laptop or tablet personal computer (PC) or peripheral.Type I cards are 3.3 mm thick and are used for add-in random access memory (RAM).Type II cards are 5.0 mm thick and are commonly used for add-on modems, fax modems, and Ethernet network interface cards (NICs).Type III cards are 10.5 mm thick and are used for supplemental rotating hard disk drives.

2) **Embedded Receiver (Hub Type)**

Receiver is used with the speed of 10 Mbps. Protocols and communication method is same as that of PC Card Transceiver. RJ 45 is used as an interface in the embedded receiver.

Embedded systems are widespread in consumer, industrial, commercial and military applications.

Telecommunications systems employ numerous embedded systems from telephone switches for the network to mobile phones at the end-user. Computer networking uses dedicated routers and network bridges to route data.

Consumer electronics include personal digital assistants (PDAs), mp3 players, mobile phones, videogame consoles, digital cameras, DVD players, GPS receivers, and printers. Many household appliances, such as microwave ovens, washing machines and dishwashers, include embedded systems to provide flexibility, efficiency and features. Advanced HVAC systems use networked thermostats to more accurately and efficiently control temperature that can change by time of day and season. Home automation uses wired- and wireless-networking that can be used to control lights, climate, security, audio/visual, surveillance, etc., all of which use embedded devices for sensing and controlling.

Transportation systems from flight to automobiles increasingly use embedded systems. New airplanes contain advanced avionics such as inertial guidance systems and GPS receivers that also have considerable safety requirements. Various electric motors — brushless DC motors, induction motors and DC motors — use electric/electronic motor controllers. Automobiles, electric vehicles, and hybrid vehicles increasingly use embedded systems to maximize efficiency and reduce pollution. Other automotive safety systems include anti-lock braking system (ABS), Electronic Stability Control (ESC/ESP), traction control (TCS) and automatic four-wheel drive.

Medical equipment is continuing to advance with more embedded systems for vital signs monitoring, electronic stethoscopes for amplifying sounds, and various medical imaging (PET, SPECT, CT, MRI) for non-invasive internal inspections.

Embedded systems are especially suited for use in transportation, fire safety, safety and security, medical applications and life critical systems as these systems can be isolated from hacking and thus be more reliable.[*citation needed*] For fire safety, the systems can be designed to have greater ability to handle higher temperatures and continue to operate. In dealing with security, the embedded systems can be self-sufficient and be able to deal with cut electrical and communication systems. [1]

In addition to commonly described embedded systems based on small computers, a new class of miniature wireless devices called motes are quickly gaining popularity as the field of wireless sensor networking rises. Wireless sensor networking, WSN, makes use of miniaturization made possible by advanced IC design to couple full wireless subsystems to sophisticated sensors, enabling people and companies to measure a myriad of things in the physical world and act on this information through IT monitoring and control systems. These motes are completely self contained, and will typically run off a battery source for many years before the batteries need to be changed or charged.

3) USB Transceiver (Box Type)

A type of connection between a computer and a peripheral device like a printer or a camera. The original USB could transfer data at a rate of 12Mbps (million bits per second), a new USB2.0 now transfers at a rate of 480 Mbps.

The Universal Serial Bus (USB) peripheral interface has become ubiquitous across all personal computing platforms as well as many industrial and infrastructure platforms.

The release of the USB 1.1 specification combined with the native operating system support offered by Microsoft enabled the rapid adoption of USB hosts in the PC. It also drove the conversion of many peripheral devices from legacy interfaces such as serial (RS- 232), PS-2 (mice and keyboards), and parallel ports (Centronix and IEEE-1284 for printers) to this common interface standard. With the release of the USB 2.0 specification enabling a higher speed connection, an even greater explosion in the number of USB peripherals available greatly enhanced the end-user experience.

The USB is a host-centric bus. In other words, the host must initiate all transfers, both outbound and inbound. The specification defines three basic types of devices: host controllers, hubs, and functions (peripherals or targets are also used interchangeably with the word function). The physical interconnect is a tiered-star topology with a hub at the center of each star. Each wire segment is a point-to-point connection between the host and a hub or function, or a hub connected to another hub or function. The addressing scheme used for devices in a USB system allows for up to 127 devices to be connected to a single host. These 127 devices can be any combination of hubs or peripherals. A compound or composite device will account for two or more of these 127 devices.

USB 2.0 is the current revision of the specification and it fully superseded USB 1.1. The beauty of USB 2.0 is that it maintained full backwards compatibility to USB 1.1 devices. However, it added a much needed third speed node, high-speed (480 Mbps), along with keeping both low-speed (1.5Mbps) and full-speed (12 Mbps) support. In July 2003, the USB OTG addendum was released defining a new class of devices aimed at portable, battery-powered devices.

The simplest way to think of a USB hub is as a splitter and repeater rolled into a single device. Hubs provide the electrical interface between USB devices and the host. Hubs are directly responsible for supporting many of the attributes that make USB user friendly and hide its complexity from the user. The hub provides additional connection points (splitter) beyond those provided by a host implementation and re-broadcasts (repeater) all traffic it sees on its upstream-facing port (towards the host) on its downstream-facing (towards the targets) ports.

Hubs are responsible for detecting connection and disconnection events on their downstream ports and reporting this information to the host. A hub must be capable of supporting any speed or type of USB peripheral (see more on this topic below) that is connected on the downstream ports. Hubs must be able to detect and recover from any bus fault due to connected target error conditions. In addition, hubs are responsible for managing the power for their downstream ports and reporting any power issues to

the host for user notification. The specification defines two different power classes for hubs, buspowered and self-powered.

Advantages and disadvantages

There are several advantages and disadvantages which are discussed below:-

Advantages

• Data transfer is faster and easier through this technology.
• Data loss during transfer is less.
• Use of minimum amount of power (of some mili volt range).
• Security is more.

RedTacton does not require the electrode be in direct contact with the skin.

High-speed communication is possible between two arbitrary points on the body.

With the electric amperage method, a clear signal line and ground line are required. With the electric voltage method, capacity coupling can substitute. Therefore, the electrode does not have to be in direct contact with the skin.

Transmission speed does not degrade with a large number of users, but it increases the pathways for distributing certain information, (big auditoriums). Material usage should be conductive and dielectric, (being a majority of the surrounding materials) Reduced data loss while in transfer. Little energy require.

Disadvantages

• It can be useful within few centimeters.
• Effects on human body is still under research.
Used only in close range.

PLANS FOR COMMERCIALIZATION

• It seems like there was a press release event where they demoed the technology. The first demo was a PDA medication assistant that shows instructions relevant to touched medicine bottles. The second was a museum guide PDA whose contents was fed from a floor-embedded transmitter through a user's feet.

• NTT plans to develop transceivers with an emphasis on portability that are more compact and less power consumption. Through field testing, NTT will continue to investigate and improve the robustness of Human Area

Networking and human body surface communication applications.

Nippon Telegraph and Telephone Corporation (NTT's) Red Tacton is a break- *throw* technology that uses the surface of the human body as a safe, high speed network transmission path. In the past, Bluetooth, infrared communications (IrDA), radio frequency ID systems (RFID), and other technologies have been proposed to solve the connectivity problem. But Red Tacton takes a different technical approach. So we, in this paper are explaining the unique new functional features and enormous potential of Red Tacton as a Human Area Networking technology.

Conclusion

The performance of Red Tacton is better as compared to other technologies. It is best to connect network within short distances. There is no any type of problem of hackers as our body itself is the transmission media. Today main issue is speed, it is solved by Red Tacton by providing very high speed of 10 Mbps within short distances.

The evolution of Red Tacton technology is a big achievement, which will likely be targeted for use in applications such as wireless headset, medical application, security applications, wireless transmission by applying different actions. This could get as simple as two people equipped with Red Tacton devices being able to exchange data such as text files as well as business cards just by shaking hands.

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