

# Providing the Smart Clothes for Security Forces by Adopting the IOT Technology

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## ABSTRACT:

There is a developing market for military-grade smart apparel and body sensors, even if they don't sell as well as smartphones. The total number of smart garments shipped will increase from 968,000 in 2015 to 24.75 million in 2021, according to Tractica's prediction. This represents a CAGR of roughly 72%. The development of new military uniforms that prioritize the soldier's well-being and provide enhanced combat knowledge has increasingly relied on smart gear. There will likely be a \$500 million market for smart military apparel by the end of next year. According to the students from the University of California Berkeley's Sutardja Center, who analyzed the smart clothing market, the military has collaborated with business moguls, other government entities, and educational institutions to back and push the creation of possible smart clothing solutions that would help the United States military by providing them with a technological and tactical edge over their enemies. Environmental sensors, which include agent detection capabilities, measure factors including radiation, chemicals, viruses, bacteria, fungus, humidity, temperature, and air pressure in order to identify and prevent potential threats. The problem of developing wearable smart clothing that incorporates body sensors is to make an item that functions similarly to regular clothes in terms of comfort, flexibility, and washing. Also, many wearable devices are designed to be worn while engaging in rough and tumble activities. Wearable, temperature-tolerant gear is essential for soldiers serving in the field. Additionally, this apparel must be resistant to chemicals, solvents, and vibrations, as well as shock and vibration, in order to protect commercial devices from harm. Cryptography, Internet of Things, Internet of Things Devices, Smart Garments, Security, Wireless Sensor Networks.

## 1. INTRODUCTION

1.1.Introduction The "Internet of Things" (IOT) is a relatively new and rapidly developing network of interconnected physical devices, software

applications, and other "things" that may communicate and share data over the Internet. Convergence of several technologies, including machine learning, commodity sensors, embedded systems, real-time analytics, and ubiquitous computing, has caused things to change. Automating processes (including those in homes and buildings), control systems, embedded systems, wireless sensor networks, and other traditional areas all work together to make the Internet of things possible. When it comes to consumer goods, the term "Internet of Things" is most often used to describe items associated with the "smart home" idea, such as lights, appliances, and computers. household appliances (such as thermostats, security systems, and cameras) that contribute to many ecosystems and may be managed by devices linked to those ecosystems, including smart speakers and smartphones.



Fig 1. Internet of Things

A distributed and decentralized digital ledger that is typically made public is known as a block-chain. Transactions that take place across many computers may be monitored with its help. Any record that is part of the network cannot have its contents changed without affecting all blocks that follow it, thanks to the way the Block-chain has been extended. Cryptographic techniques based on public keys are used by blockchain security measures. All of the computers that participate in the blockchain network have a common address, which is a random string of letters and numbers called a public key. The address is associated with

value tokens transmitted over the network. To access sensitive information, an owner needs a private key, which functions similarly to a public key but is owned by an individual. The creation of a wallet for every user on the blockchain makes considerable use of RSA.

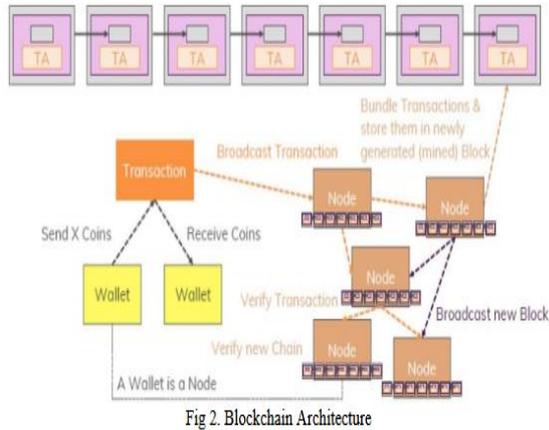


Fig 2. Blockchain Architecture

Distributed ledger technology, of which blockchain is a part, will inevitably play a role in the direct inter-device communication that is inherent to Internet of Things applications. This will allow devices to record not only their own interactions but also their current states and, in the case of tagged goods, their handling. A foundation for applications involving transactions and interactions is what blockchain is all about. Some examples of such smart apps that facilitate certain IoT operations include smart contracts, which are pre-programmed to execute themselves in response to the occurrence of certain events (such as the state of a product or the state of the environment). In this approach, blockchain technology may enhance the IoT's compliance, performance, and efficiency without sacrificing any of its benefits. Identifying the Issue To develop powered armor that troops may use in battle. By combining cutting-edge smart technologies with the IoT and Blockchain. Applications built on the blockchain that facilitate the Internet of Things may manage large numbers of IoT devices, improve data security, and establish the reliability of data. Nevertheless, owing to the restricted power, storage, and processing capacity of IoT devices, there are still some obstacles to installing IoT apps on blockchain platforms. Existing consensus methods have a high computational cost, poor scalability, and are susceptible to Sybil node assaults when used to Internet of Things (IoT) applications. Since third parties cannot ensure that data is not altered before transmission, sale, or usage, IoT cannot be relied upon completely outside of the data owner's domain. For instance, there is currently no way for ridesharing companies like Ola and autonomous vehicle startups like Uber to exchange reliable mapping or ride data. They do this instead by

collecting and storing comparable datasets autonomously on their servers. Here are a few issues that the existing consensus algorithms for blockchain-based IoT encounter: Issues with data ownership and integrity 1.2.1 Section 1.2.2: Extremely centralized systems 1.2.3 Damaged by many cyber-attacks 1.2.4 A single failure point.

## 2.0 REVIEW OF THE WORKS

Article[1] Design Challenges with Intelligent Garments for Use in the Military rehabilitation professionals may now monitor their patients' progress with the use of this technology, which uses algorithms and an individualised user interface to set up individualized regimens. By continuously detecting physiological signals, wearable health monitoring devices keep tabs on a person's physical condition and performance. This system monitors the health of military personnel, their progress in rehabilitation, and any changes in their abilities over time by integrating data from various environmental and performance sensors with data from well-known human monitoring technologies. Section 2.2: The Main Idea The first stage in developing smart garments is to determine the necessary measuring parameters. We must first determine whether the sensors can be worn and, if so, where on the body they should be put. places with small movements while placing sensors, places with bigger motions as surfaces, and areas with generally constant size among humans should be considered, according to.



Fig 3. The smart System diagram

Article [2] Pros and Cons of Intelligent Garment Design for Use in the Military .It is possible to quantify the thermophysiological condition using a thermal imaging method. Range of motion may be measured using an inertial motion capture equipment. These days, new methods in Digital Human Modeling (DHM) may be used to generate a data model of a virtual soldier using smart clothing to execute a motor job (Fig. 11). The goal is to determine the effect of equipment design on performance by identifying and quantifying the most relevant critical factors affecting effort and work completion. The third prototype, a vest that can monitor a soldier's performance in terms of training, injuries, and psychological state both inside and outside of water, was realized via

iterative research on the co-design process. This allowed us to redefine the final functional garment. One goal of this idea is to make things more comfortable and flexible by reducing the number of designs and, by extension, the number of fabric connections. The vest is a form-fitting piece of breathable apparel that gives you complete freedom of movement.

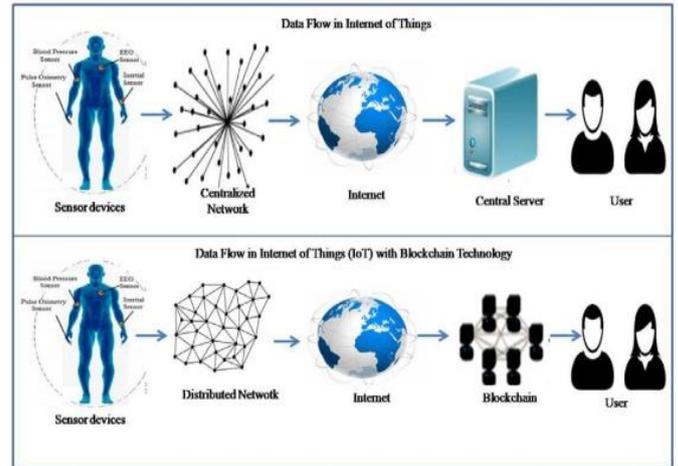


Fig 4. The first prototype-front

The purpose of this project is to develop, manufacture, and test an intelligent soldier jacket that can sense and respond to the soldier's physiological and environmental signals. The jacket will also include antennas, signal processors, and communication capabilities. The first focus will be on creating multi-chip modules and flexible circuit boards made of textiles. Afterwards, several kinds of microwave and radio frequency antennas will be designed, made, and evaluated on polymeric and textile bases. At last, a variety of sensors will be created and incorporated into clothing. Among the qualities that will be useful to soldiers are signal processing chips, chemical sensors, and communication chip, which will facilitate movement, danger identification, and dialogue. The armored vehicles of the future will include integrated temperature control, navigation, and water purifying systems. Super suits will not be able to increase the strength and intelligence of fighting troops for at least another ten years. “ According to the article [4]: Blockchain technology employing consensus mechanism for IoT-based e-healthcare system, e-healthcare systems utilize sensors to link devices and improve day-to-day patient activities. Every Internet of Things device has its own distinct programmability capability. In 2030, there will be 125 billion linked IoT devices, according to Ihsmarkit. Through the use of IoT devices, doctors may keep tabs on their patients' biometric information in real time. The majority of the devices now connected to the Internet of Things (IoT) are authorized by servers. Server failure impacts all devices in the IoT system, therefore these centralized servers should have significant

infrastructure and maintenance costs. Therefore, dependable service requires an effective central server. Data breaches and hacking are also big problems with the current concept of centralized communication in the Internet of Things. Protecting the flow of patient information in hospital networks, the suggested blockchain approaches.

Fig 6. Blockchain in health care sensors



A user's needs and convenience were taken into account as the analytics progressed. Simultaneously, as seen in Fig. 6, the blockchain has expedited data transmission via dispersed networks. The Internet of Things (IoT) integrated with blockchain technology would lessen the occurrence of hacking incidents, as well as the expenses associated with setting up networks and maintaining servers. A decentralized healthcare system has been created via the integration of the Internet of Things (IoT) with blockchain technology. In this article, we'll go over some of the consensus algorithms that are utilized in blockchain networks and how they integrate with healthcare systems that are built on the internet of things. “Article[5]Army Coat with Smart Technology Make use of IoT and CMD When discussing service-oriented Internet of things (IoT) implementation, the Internet of Things brings up the challenge of reaching agreement on services across various IoT edge nodes, where data may be inadequate or overloaded. Current statistical approaches seek to address the discrepancy, which need sufficient data for decision-making. By including a broader variety of data points than traditional statistical techniques, distributed consensus decision making (CDM) approaches may provide a dependable and efficient way to synthesize information. Minimizing the multi-parameter dependent matching value is the first topic covered in this discussion on service composition for the IoT. The next step is to suggest a distributed method based on clusters that would iteratively aggregate locally determined

consensuses to create a global consensus. The reliability and consistency of the decision-making procedure are enhanced by the distributed consensus approach. Additionally, this study introduces a distributed CDM approach to the Internet of Things (IoT) that can detect, classify, compose, and analyze data. Distributed average CDM's reliability and performance are two areas that the suggested method hopes to enhance. To begin, it suggests a three-tiered service provisioning architecture for service-oriented Internet of Things (IoT) deployments that can depict, find, identify, and construct services at the network's periphery. Services are able to base their choices on application layer needs using the suggested CDM technique for service composition. Afterwards, a distributed consensus method is suggested to provide strong decision-making outcomes in cases when several services are engaged in achieving a worldwide agreement. We can see how well and efficiently the suggested strategy works in simulations. Creating services that are more all-encompassing and address every stage of the service lifecycle is a goal of future study.

### 3. METHODOLOGY

#### 3.1 The Employed Technologies

##### 3.1.1 The heart rate sensor is 3.1.1.1.

Pulse waves, or changes in blood vessel volume caused by the heart's pumping action, may be detected using an optical heart rate sensor. An optical sensor and a green LED measure the change in volume to detect pulse waves. To reduce the impact of environmental light, including red and infrared rays, the sensor block uses an optical filter that is tuned for detecting pulse waves. That way, you can get good pulse signals even when you're not in a crowded place. Furthermore, ROHM was able to greatly enhance the sensor block's sensitivity by using optical sensor technology that had been developed over a long period of time. A low-power optical heart rate monitoring system can be realized without the requirement for extra circuitry (i.e., a boost circuit) because to the support for low-brightness, low-VF LEDs. This helps wearables with low battery capacity to operate for extended periods of time. Mobile Heart Rate Monitor.

##### 3.1.2 Sensor for Temperature

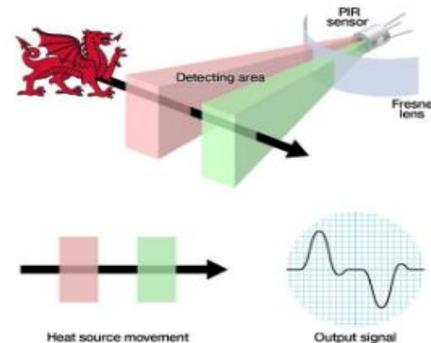
To record, monitor, or communicate changes in temperature, a temperature sensor translates the input data from an electronic device that monitors the surrounding environment's temperature into electronic data. A wide variety of temperature sensors are available. There are two main types of temperature sensors: those that detect the temperature indirectly (non-contact temperature sensors) and those that need physical touch with the item to be monitored (contact temperature sensors).

Typically, infrared (IR) sensors are used for non-contact temperature measurement. From a distance, they may pick up an object's infrared radiation and relay that information to a calibrated electronic circuit, which then calculates the object's temperature. All aspects of daily life rely on temperature sensors. These crucial technological components determine the thermal output of a system or item. Thanks to the provided data, we can detect a change in temperature with our naked eye. The use of temperature sensors in preventative measures is crucial. When a certain temperature is reached, the sensors will sound an alarm, giving you enough time to take precautions. As an example, consider smoke detectors.



##### 3.1.3 PIR Sensor

The PIR sensor itself has two slots in it, each slot is made of a special material that is sensitive to IR. The lens used here is not really doing much and so we see that the two slots can 'see' out past some distance (basically the sensitivity of the sensor). When the sensor is idle, both slots detect the same amount of IR, the ambient amount radiated from the room or walls or outdoors. When a warm body like a human or animal passes by, it first intercepts one half of the PIR sensor, which causes a positive differential change between the two halves. When the warm body leaves the sensing area, the reverse happens, whereby the sensor generates a negative differential change. These change pulses are what is detected.



### 3.1.4 GOOGLE GEO LOCATION

The Geolocation API returns a location and accuracy radius based on information about cell towers and WiFi nodes that the mobile client can detect. This document describes the protocol used to send this data to the server and to return a response to the client. Communication is done over HTTPS using POST. Both request and response are formatted as JSON, and the content type of both is application/json.

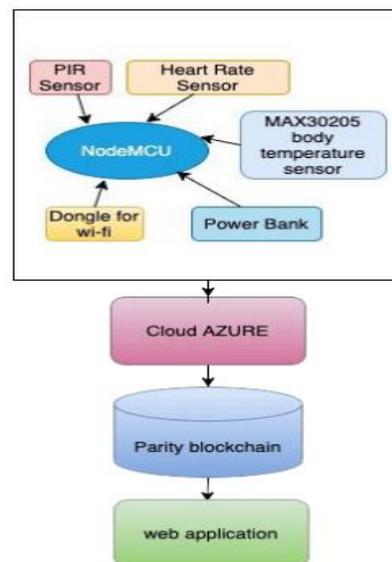
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{
"homeMobileCountryCode": 310,
"homeMobileNetworkCode": 410,"radioType":
"gsm",
"carrier": "Vodafone","considerIp": true,
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// See the Cell Tower Objects section below.
],
"wifiAccessPoints": [
// See the WiFi Access Point Objects section
below.
]
}
```

### 3.1.5 NODEMCU

NodeMCU is an open source firmware for which open source prototyping board designs are available. The name "NodeMCU" combines "node" and "MCU" (micro-controller unit).[8] The term "NodeMCU" strictly speaking refers to the firmware rather than the associated development kits.[citation needed] Both the firmware and prototyping board designs are open source.[8] The firmware uses the Lua scripting language. The firmware is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson[9] and SPIFFS. [10] Due to resource constraints, users need to select the modules relevant for their project and build a firmware tailored to their needs. Support for the 32-bit ESP32 has also been implemented. There are two available versions of NodeMCU as version 0.9 & 1.0 where the version 0.9 contains ESP-12 and version 1.0 contains ESP-12E where E stands for "Enhanced".[11]

### 3.2 Working Principles

1. The Optical heart rate sensor and the MAX30205 sensor, respectively, sense vitals such as heart rate in BPM and body temperature.
2. A PIR sensor is used to detect human movements surrounding the person wearing smart cloth as an extra feature.
3. The information collected from the above-mentioned sensors, integrated in clothing, is then forwarded to the AZURE cloud, where it is tracked using NodeMCU and Google Geolocation.
4. On the AZURE cloud, the Antares IOT platform integrates location coordinates, heart rate BPM, and body temperature measurements (in Fahrenheit).
5. The data from the cloud is subsequently hashed and stored on the Parity blockchain, which serves as a database.
6. The position and vitals of security staff are saved in Parity and analysed to determine each security personnel's status.
7. These details are made available to monitoring centres using a centralised web application that is linked to the database.
8. The online app allows the authorities to easily monitor the data. On the web app, data is updated on a regular basis. It also allows them to respond to casualties more quickly.



### 4. CONCLUSION

Wearable advances are currently infesting numerous applications in a few fields. The point of this paper is to abridge the genuine savvy attire in the military field where conditions could be basic for wellbeing and security, and diagram the advancement pattern for inventive administrations to security forces and warriors. Also Smart clothes that exist today are expensive because of the use of conductive yarns for providing interwoven circuitry. We believe that our idea of creating smart clothes can be cost efficient and provide precise information about the location and psycho-

physiological details of the wearer without compromising security and privacy.

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