



A Journey from Smart Technology to Social Internet of Things

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Abstract: *Internet of Things (IoT) has gained attention in the technology world over the past several years because it offers more ways to access data, leverage intelligent systems and that provide groundbreaking results that will alter the course of information technology as we currently know it. In an effort to increase data availability, processing and real time decision making at the lowest affordable cost, social networks and IoT have recently been combined to create SIoT (Social Internet of Things). This work covers IoT, SIoT and relation management in SIoT. It also covers the issues that impede SIoT's development.*

Keywords: *Internet of Things, Social Internet of Things, Relation Management, Social Internet of Vehicles, Intelligent Transportation System.*

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1. Introduction

In future, the Internet is anticipated to embody a huge variety of virtual objects providing variety of services to the end-users via the use of communication protocols and unique addressing schemes. In fact, it is anticipated that billions of items will play a significant and active part in the future network, transferring information from the physical world into digital commerce and services. The aim of Social Internet of Things (SIoT) is to provide awareness about the intelligent gadgets and to society with one another based on shared context and mutual interest was recently proposed as a way to integrate social ties among communicating items.

The Internet of Things (IoT), the resulting networking paradigm, will provide users, manufacturers, and service providers an unparalleled set of opportunities with broad applicability across numerous productive industries [1]. These encompass a wide range of areas; including security and surveillance, smart homes and workplaces, inventory and product management, environmental monitoring, and health care. In Internet of Things, everything that is real transformed into something that can be found, addressed and read online. Parallel to this, the concept of the SIoV is used, where SIoT concepts can be applied to the

vehicular domain so as to make significant changes in the current ITS solutions by enhancing the value and intelligence of the vehicles, evolved from the application in the Intelligent Transportation Systems (ITS) [2].

Humans are still a relevant factor in the SIoV paradigm. It is noticed that human characteristics and behaviour have a significant impact. For instance, the everyday routines of people have an important act on the mobility pattern in SIoV, and many applications are heavily user-oriented. In SIoV paradigm has a twofold nature; the first one is derived from SIoT, where the vehicles play important role as the active devices and the social ties can be made among the vehicles and the second is pillar depends on the human behaviors and their daily routines so as to increase the social ties and communities. Specific applications exist as a result of the two natures' distinct differences in features. Given that the two techniques adhere to separate sub-architectures, their cohabitation is permitted in an integrated manner. An integrated framework enables the incorporation of both two approaches as a consequence [3].

2. Social Networking and SIoT

Since the advent of the Internet, more than 1 billion people have had the ability to connect to the World Wide Web, creating previously

unfathomable opportunities for communication and collaboration. Today's electronic media and social networking have led to mean people using the Internet and Web applications to contribute in endless ways. All of this is the end result of a general, widespread change in how people use the Internet and its potential effects. The idea of social networking has been for a very long time since human being have been social creatures that work in groups, communicate and assist other in order to complete the jobs. In the modern world, people utilize social networking sites like Facebook, Twitter, Instagram, LinkedIn, and others to exchange ideas, photos, videos, and information. This philosophy and concept is further used in the current trend, which renames the Internet of Things concept to the "Social Internet of Things" [4].

The term "Social Internet of Things" (SIoT) refers to an Internet of Things (IoT) where objects are suitable for forming social relationships with other objects, without regard to people. Thus, a network and organization can connect nodes in both informal and formal ways to send and receive data [5, 6]. In the SIoT, the "things" are social as well as connected to one another. In other words, it is simple to change a "thing" into a "smart and sociable" object.

Some of the advantages of SIoT are as follows:

(a) The SIoT structure can be designed as needed to ensure the framework

navigability, so that the disclosure of things and organizations is performed fairly.

- (b) Flexibility is guaranteed, just like it is for humans, and a level of dependability can be made for utilizing the level of collaboration among things that are friends or companions.
- (c) The mechanisms created for social networking can be used to handle the problems and challenges associated with the IoT [7].

(i) **The Social Internet of Things System**

An overview of the SIoT system is provided in this section. The following are the components of the Social Internet of Things.

- (i) Smart Things and User
- (ii) Intelligent System
- (iii) Interface
- (iv) Internet

The components are as explained below:

(i) **Smart Things and User**

Every physical or virtual device has the capacity to collect and transmit data, according to the fundamental IoT needs. Therefore, in the SIoT, gadgets and people can both contribute equally to the publication of data? This information may be used for profiling purposes or in response to user or device enquiries. Users can submit queries to learn more about nodes, the closest

node, to receive updates, or to learn the status of certain devices [8, 9].

(ii) Intelligent System

It is responsible for processing of the query, application management, recommendation, service discovery, and context and data management.

(iii) Interface

An interface facilitates communication with intelligent systems. It receives input from the user or from a device and transmits it to an intelligent system for additional processing. Later, it uses the intelligent system’s output and delivers the output to the user or device. Smart interfaces can also talk to one another to exchange data [10].

(iv) Internet

Internet serves as a channel of communication between users and machines. Interaction between gadgets also helps.

2.2 Relation Management in SIoT

Many fascinating articles in the SIoT have been mentioned to Relation Management (RM). For instance, it is claimed that every social network item receives more precise replies to their queries than independently functioning items [11]. As a result, in order to build social network and seek or reply to pertinent services, these objects must connect with one another. This is how the SIoT operates. In addition, the major goal of the SIoT is to decouple things from people so that they can develop autonomous social networks. To help

them determine whether to begin, maintain, or abandon a friendship. Thus, RM demonstrates the hidden intelligence of objects [12]. Each object must also decide how it will relate to other things in order to exchange pertinent resources, data and services.

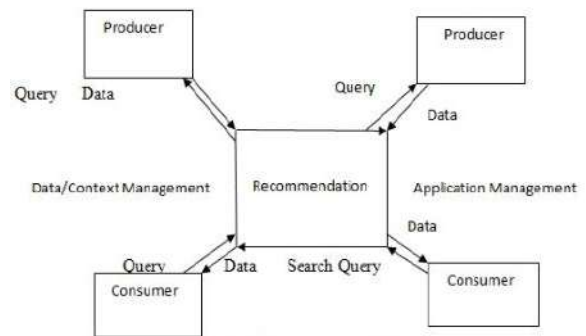


Fig.1. Components of SIoT

The relationships between various devices can be divided into five major categories: parental object relationship (POR), owner object relationship (OOR), co-work object relationship (CWOR), social object relationship (SOR) and co-location object relationship (CLOR). These are explained as below:

- (a) Parental OR (POR): This link is established between things in a production facility, and typically, all objects that work together are homogenous.
- (b) Owner OR (OOR): This relationship is created between things that have a certain owner, such as several apps on a person's phone.
- (c) Co-Work OR (CWOR): This connection is made between things that cooperate for the

same goal even though they are located in different locations.

(d) Social OR (SOR): This relationship is based on the social connections made between the owners of the products, which cause their gadgets to work together.

(e) Co-Locate OR (CLOR): This relationship forms between things that are homogenous or heterogeneous and are located in the same location.

(i) **Transforming Internet of Things to Social Internet of Things**

The Internet of Things promise to bring about a lot of great benefits for our lives. But if appropriate new models for communication are not found, it will undoubtedly cause problems for those who develop telecom systems and apps. We unquestionably acknowledge that a social approach to handling the Internet of Things will undoubtedly meet the concerns of customers, planners, and engineers.

There are various advantages to combining the IoT and social networking principles. First, the SIoT network structure can be created as needed to ensure effective navigability among the components based on a variety of aspects (like collocated, similar characters, etc.), allowing for the efficient detection of services and objects that support the composition of solutions for challenging tasks. Second, teamwork, like in

social networks, ensures scalability. The degree of interaction between objects that are friends or friends of friends in the SIoT can be used to leverage a level of trustworthiness. The social object only develops connections with reliable things. These items function independently and in close interactions with other things to provide the needed services. Finally, it is possible to leverage models created to analysis social networks to address IoT-related problems.

The SIoT is a "new era of miracles for science." Numerous academics from different countries have taken social media platforms like Twitter, Instagram, Facebook, and LinkedIn into consideration [13]. The idea that the "Internet of Things" and Social Networks" universes could merge is becoming more and more popular recently. This is due to the growing awareness that the ideal "Social Internet of Things" (SIoT) model would have several positive effects, affecting people's daily lives. Plans have also been proposed to use social ties to develop greater levels of trust, boosting the effectiveness and sufficiency of security measures.

The Internet of Things (IoT) links a variety of objects in our environment that is capable of for minimum.

By influencing real world entities to improve the quality of life for the next generation of humans, smart IoT has the potential to change software and hardware applications in the future. It includes:

(a) Service Discovery Process in SIoT

The goal of service discovery is to identify the objects that provide the right services for the users. Locating things, information, and services in IoT is a crucial problem, especially in real-time settings. In the SIoT, a discovery function applies to both individuals and objects. The SIoT creates social structures between individuals and objects with the intention of providing services.

(b) Network Navigability

If and only if there is a shortest path between every pair of objects in the network, or almost every pair, then the network is navigable [15]. The numbers of smart items that are currently connected to the IoT are growing, so have the relationship and accessibility timeframes for service search. With the aid of social networks, social IoT offers a solution for quick access to such devices.

(c) Trust Management

Trust is a measure of belief, assurance, and anticipation regarding a person's moral character, emotional stability, honesty, physical safety, and other attributes. Because ensuring user and system security is a crucial step in establishing trust, security and trust are closely related concepts.

(ii) SIoT Issues

The issues which are impeding the development of SIoT are as given below:

(i) Data Management

The Internet of Things (IoT) is made up of several heterogeneous components that continuously transmit data in various formats. As needed, the data must be processed, filtered in real time, and sent to the target user. The data's semantics should preserve its objectivity, validity, reliability, consistency, sensitivity, appropriateness, and interest. There should be a dynamic method of handling the data and managing it in a way that decreases redundancy and promotes efficiency among devices.

(ii) Heterogeneous Devices

Regardless of the many platforms they were developed on, many devices, including computer, mobile devices, sensors, actuators, and RFID, communicate with one another in a single environment. Real-Time interoperability is challenging to implement in such a situation. The time it takes for objects to communicate and comprehend one another will negatively impact the performance of the entire system. Data transported in the SIoT will be in multiple forms and require analysis and processing for decision-making [16]. In SIoT, devices and people should interact in a way that is both user-friendly and machine friendly. However, openness has not yet been attained, and there isn't complete IoT interoperability, which has an impact on the development of global SIoT designs.

(iii) Security, Trust and Privacy

Many problems arise as a result of the security,

privacy, and trust challenges presented by the interaction of nodes in the Internet of Things [17, 18]. How well is privacy protected between nodes? How reliable is the anonymized data, and can it not be broken down? Due to security risks that develop when data is readily accessed between devices, there is no clear degree to which the items should interact, which creates problems. After filtering, what will happen to the collected data? If it is needed, will it be discarded?

5. Conclusion

This work focuses on the “Social Internet of Things” which supports the introduction of informed communication concepts into the Internet of Things. Recently, the SIoT has been the focus of a few open research projects because it promises to achieve flexible arrangements in systems with trillions of hubs and to foster new intriguing applications. Social Internet of Things (SIoT) refers to an Internet of Things (IoT) where objects are suitable for forming social relationships with other objects,

without regard to people. In this work, we have discussed about the Relation Management that shows how objects have hidden intelligence. In order to exchange useful resources, information, and services, each object must also select how it will link to other things. We have also discussed about the issues in SIoT such as data should be handled dynamically and managed in a way that reduces redundancy and increases device efficiency, devices and people should communicate in SIoT in a way that is both user and machine friendly. The lack of full IoT interoperability and the lack of openness, however, have an impact on the evolution of international SIoT designs and lastly we have discussed about security and privacy threat as there is no apparent degree to which the objects should interact, which causes issues. This is because there are security dangers that arise when data is accessed between devices.

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