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Internet of Things Attacks and Countermeasure Access Control Techniques: A Review

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Abstract

This is internet revolutionary era, in which every little to big physical device is becoming smart and more smart day by day by connecting itself to the internet. In internet of things environment, every device is different i.e. The IoT (Internet Of Things) mainly consist of heterogeneous devices that will share and communicate the information with each other. So in internet of things environment require flexible, adaptive and light weight access control system so that devices can communicate with each other securely. The physical devices are more prone to attacks, misuse or abuse in these types of environments So this changing and challenging environment needs secure, light weighted and adaptive access control mechanisms so that heterogeneous devices exchange information securely and timely with each other without or very little intervention of a human. The mechanism of access control and authentication are the trending topics of research in the IoT. In this paper, we are going to discuss about access control systems in internet of things.

Keywords: Internet of things, access control system, security,

I. INTRODUCTION

The main function of the computer system is mainly to create , transfer, process and also to store the information which are indispensible to th present modern enterprise. There is always an on-demand connected driving the data with world which is based on the transformation of the entire economies from the manufacturing unit which is mainly based on the paradigms to the knowledge, which is based on many of their organization for rightly counting the information system as this is the most information asset available. These are the types of IT systems which are used very often by the various organization in order to process and store the huge amount of sensitive data, which if disclosed can cause potential damaged to organization.

Table 1.1: Characteristics of IoT Security Models

Characteristics	Description
Interconnectivity	Global information and the communication infrastructure can be connected to everything.
Things-related services	The thing related services must be provided within the constraints of things such as semantic consistency of virtual and physical things and privacy.
Dynamic changes	The SoD (state of devices) can change very dramatically as the number of devices can be vary. The states of devices are connected, unconnected, waking up and sleeping.
Heterogeneity	The devices having the IOT have different hardware and can use different network. But still they can interact with each other devices through the different types of network i.e. See figure in case 1.
Enormous Scale	The various number of devices operating and communicating will always be large than the number of devices in the present internet conditions. Most types of communication will be device to device instead of human to human.

The unauthorized disclosure will embarrass the organization at its worst and it will also lose its competitive stance in the market if the information provided was proprietary secret trade or if the competitive information is confidential it may be sued. Some of the companies were gone out of the business if the damage from an unauthorized access is proved to be very great. Losing the competitive advantage or shutting down the business is a very grave situation. IT systems are now integrating with an even control critical national infrastructure components such as hardware components which are responsible for the safer operations of the power plants, transportations systems and chemical manufacturing facilities. It is very difficult for controlling these types of access as it can cause life loss or infrastructure and environmental damage which will lead to an malicious or improper damage. The information security is an umbrella term for the process and various methodologies used in order to protect the information, system and various confidential data. Protecting

in regards to the information security means preventing the unauthorized access, uses, disruption, disclosure, destruction and modification. The basic three principles that can be considered are the availability, integrity and confidentiality [32, 33, and 34]. The most important principle is the accountability and it is sometimes included by the security companies i.e. ABB and combitech. These concepts are explained in detailed in the Table 1.2.

Table 1.2: Principle used in Internet Security

Principles	Description
Confidentiality	Confidentiality mainly refers to the ability to protect the data or information from the people who are not authorized access or view the data.
Availability	The term availability is defined as the ability to ensure the reliability and access to the data and information whenever needed.
Integrity	The term integrity refers to the ability to prevent the unauthorized modification of the data and information thus it assured its reliability and accuracy.
Accountability	The term accountability refers to the ability to trace the modification of the information. A basic concept was used which is to trace by who and when change was made [33, 35].

The risk of an unauthorized access of data, resources and the systems must be minimized, the various organizations uses the access control mechanism. There are several models exists for access control mechanism. The corresponding model of control mechanism and the concrete implementations of those access controls model can take various forms by making use of the different technologies and various underlying infrastructure components involving various degree of complexity. The most complicated models in some of these cases expands upon and hence it enhances their old models. But in the other case, we needs to rethink of the primary manner where the access control should be done. In most of the cases, we need more new complicated models which are not arising from the deficiencies in the security which is mainly provided by the old models. They also need the new models in order to address the change in their organizational structures, need of the organization, technologies and technical capabilities or the relationship within the organization. The B2B relationship enables the organization in order to successfully execute their missions i.e. for example- System or users is requires by the systems from one of the business to another in order to access the various resources from various partners of business. SAC models are not often meet the requirements of complex access control require by such relationship. Also more powerful, granular and dynamics models mechanism are always needed to in order to address these new realities. Summarizing, the increasingly complexity of the data access and the sharing requirements drive the various needs of increasingly complex access control models and the mechanism. The remaining of this paper explains the future and current access models which mainly includes the list of access controls, RAAC (risk adaptive access control), which also includes the infrastructure which is needed in order to support them. ABAC is mainly an access control model where the decision of access control are mainly based on various set of characteristic or the other attributes which are associate with the requester and also the environment or the resources within itself. Each attribute is discrete and having distinct field in which a policy decision can easily be compare it against the given set of values for determining whether to allow or deny the access to user. Attributes can easily be treated as a diverse i.e. the we need to know the date of the employee when it is hired, the location of that employee or some combinations of the above. The role of an employee within an organization is to serve an attribute which can be used in making a decision foe access control.

The role of the IoT is to enable the on-demand access to the various sources of data such as pollution and healthcare. The IOT (Internet of things) are mainly utilized with the platform of cloud computing in order to aggregate and analyze the data on the arrival. Due to the rise on the various applications of Internet of things, it makes them very attractive and economically sensible for all the clients with the live and dynamic data requirements. An overview of the various publications in the field of security of remote storage or security of cloud computing and computations and hence the various topics covered in the work mainly include:

- **Client authentication and authorization:** The current body of the work must be covered which is based on the methods for exploiting and disrupting the interface between the clients of IoT and the data aggregation services and this is usually carried out by the wireless network.
- **Security shortcomings of hardware:** In this the problem is described which is having the surface along with the use of limitation of hardware by the manufactures of IoT. How the Internet of things nodes needs to be exploited for obtaining the unauthorized information from the various vulnerable users and it also indicate that the mitigation techniques that are used can easily be employed. Vulnerabilities are also addresses in addition to the usage and also the sharing of data over the whole network.
- **Flooding attacks and denial of service (DoS):** Because Internet of Things applications involves the very sensitive data in many real-time applications, an attacker may use that characteristic to maliciously centralize a large portion of IOT (Internet of things).

- **User accountability or its ability to capture and expose wrongful activity:** The various capabilities needs to be discussed is very must for an accountable system and hence it also provides the various types of solutions in order to achieve these types of capabilities.
- **Challenges and solutions for data protection:** Several techniques needs to be deployed by the clients of IoT in order to verify integrity of their outsourced data.
- **Protection of outsourced computation:** Finally, we have to give an overview of the various types of current approaches which is mainly used for assuming the privacy and the integrity of the outsourced computations.

II. ATTACKS ON IOTs

In this section, we have to analyze whether the proposed protocol is secure or not.

1) Eavesdropping Attack

For each run, we have to produce a key for different session and it may also have the past session knowledge which does not allow the deduction of the future sessions key. We have shown how to calculate the session key by one by hash in this work. The abP is only known by the RA and the user, which can easily be computed from the ephemeral key generated randomly. Even if the secrets of the previous sessions are revealed all the other secrets are unknown to the adversary.

Man-in-the-middle Attack

SA, which is an long term secret key, can easily be compromised and this this does not lead to compromise with the communication in the past. The adversary in this scheme is mainly compromise the secret key of RA and hence it cannot be compromise with the key from the previous session. The main reason is that this adversary cannot be shown by the ephemeral key a or b and th session key cannot be easily computed. Our protocol satisfies both the PFS (perfect forward secrecy) and PFS (partial forward secrecy), as it is very hard to compute the session key without knowing the ephemeral key a or b

Key Control Attack

A random number is selected for both the entities of communication for generating the session key and this can easily be discarded after the session has completely been expired. No one is able to control the outcome of the session i.e. for example- by restricting it some small set which are already defined. Thus, we can conclude that none of the entity can enforce the session key for a value that is already selected. Hence, the proposed protocol can now resist any type of attack on control key. A CNT (captured network traffic) or a valid session key is gained by the malicious one in the Internet of things. The replay attack should be resisted by the protocol by mainly introducing the none in each of the message transmitted. The choice could be optional which can be varying on the different applications and the session key must be used for the identification. The replayed message which is from an unidentified person will always be discarded.

SECURITY MECHANISMS

When talking about the information and the system, the question which arises is the concept which needs to be met. We have to ensure that system remains unaffected by the means of negative impact that is to be achieved. There are lots of the potential answers which for the above question and all of the answers have one or more concept. The list of examples are shown in the below table 2.3 and all of these answers have at least on or the more concept.

Table 1.3: Examples Answers

Answers	Concept(s)
No unauthorized person can access the information	Confidentiality
The correct information is delivered	Integrity, accountability
The receiver can confirm who the sender is	Authenticity
The information is delivered	Accountability, Availability

III. ACCESS CONTROL

The most popular system are collaborative system which mainly provides a scalable access and are very efficient. A set of organizations can share their computing resources in the collaborative systems such as computer cycles, storage places or online services for establishing the virtual organization which is aimed at achieving a particular task. The most difficult task is to balance the collaboration of competition tasks and th security because of the interaction of the collaborative system is mainly targeted towards making people, resources and the information available to them, whereas all the other information of security is to ensure the availability, integrity and confidentiality and also providing them with proper authorization [TAPH05]. An access control decision has to be made on the various objects and the subjects. When most of the objects and subject are mainly involved, then we have to develop an object-subject model which cannot provide management for satisfying the security. In RBAC, the primary thing that is associated with the roles is permission and all the users are made up of the members and hence they acquire the permission roles. Role based access control mechanism is much more scalable than the user which are based on the user and this mainly reduces the cost of an administrative. much more scalable than user based on the However, various attempts are applied in the RBAC in the collaborative environment which revealed some of the limitations that are described below:

1. Role based access control mainly lacks the ability to specify a fine grained on the individual users which

is used in the certain roles and are also on the instances of the objectives. When talking of the collaborative environment, it is nt possible or insufficient to have a role based permission which is mainly based on the types of object.

2. RBAC does not take the various impact of context. This access control is mainly belonging to a PSM (private security model).It is highly demanded in an collaborative environment than and access control system needs to be consider th overall context which is mainly associated with any of the collaborating activity.
3. In RBAC, it mainly assumes that all of the permissions needed for performing a job can easily be encapsulated neatly. The main challenges of the RBAC are the contention which is between the strong security and the easiness of the administration. Each role must be more granular for a stronger security and thus multiple roles per user can be used.
4. The most important aspects of Authorization constraints are RBAC which is a more powerful mechanism in order to lay out the policy of higher level within an organization.
5. Role based access control on the other hand does not requires any abstraction for capturing a set of collaborative users which are operating in the different modes.

4.1. Discretionary access control

The main function of DAC is to leave a certain amount of AC (access control) to the discretion of the of the owners of object or anyone else that is having an authorized control to access the object. For example- A user is always limited to access to a file. The users which are only specified by the owners must have combinations of write and read and they are also executing the other permission to the file. The policy of the Dynamic access control (DAC) tends to be very flexible and widely used in the government and commercial sectors. There are two weakness of the DAC i.e. the first one is for granting the read access. Now the Bob can also grants the permission to any user to the copy of Annie file without the permission of Annie. The second one is the Dynamic access control policy which is vulnerable to THA (trojan horse attacks. The program mainly inherits the unique identity of the invoking user and now the bob can easily wrote a program for Annie which is useful in performing some useful functions and it also destroys some of the file contents of Annie. While this problem is investigating the role of the audited files and this would mainly indicate that the Annie mainly destroyed the files of her own and the main drawback of the DAC are as follows:

- The crucial information can be easily copied from one subject to another and hence there is no real assurance of the information flow in the system.
- No restriction should be applied to the various usage of information whenever a user has received it.
- privileges are the deciding factor for accessing the object and this is mainly decide by the owner of the object.

The ACL and the other owner or group mechanism for access control are used for implementing the policies of DAC.

4.2. Mandatory access control

These types of access control is mainly supported by the military search which is mainly supported by the RoM (research of military) and the civilian government which enforces the AC (access control) by various means of labels of security. These types of models were first developed by the Lapadula and Bell which is mainly attached by the labels of security. A minimal model is introduced by the Sandhu named BLP and the access or this is mainly granted which is based on the subjects and accessed objects security labels. The sensitivity classification which is mainly used by the military which mainly includes unclassified, restricted, secret, and confidential and the top secret. The labels of security from the lattice having a partial order relation, $\leq$. This model was mainly developed by keeping in mind the military environment and one of the major issue was the confidentiality which can easily be achieved by the information which are among the entities of the different types of groups of security. These types of restrictions are mainly expressed by the two properties:

- SSP (simple security property) which is also known as "no read up" states i.e. a subject can only read an object if an only if $\lambda(o) \leq \lambda(s)$.
- The "property", or "no write down" property, which is mainly allows the subject in order to write an object if an only if $\lambda(s) \leq \lambda(o)$. This property mainly addresses the information leakage by the malicious programs. It is also does not allow the various programs to write an information to the objects that can easily be read by the subjects with a least privilege security clearance. A variation of this property is also called "strict property" which mainly requires that the information can easily be written at, but not above the subject i.e. the subject clearance level, formally $\lambda(s) = \lambda(o)$.

A model which is very similar the BLP was mainly developed by the Biba. Unlike the main role of the BLP and Biba models is to achieve the integrated data which is opposed to the confidentiality. These types of model mainly allows the flow of data from the high to low integrity of data i.e. it is exactly the inverse of the information that is permitted in the BLP model. The security policy for a particular type of system states that:

- The owner of the object should not decide the decision of protection.
- The decision of protection must be enforce by the system.

4.3. Role-based access control

MAC has a rigid nature and the here the users had almost a little or no control over the access control policy and also on all the problems which are mainly associated with the change in the policy of DAC and the models of access controls Considering the large organization, where the realization of data is not owned by the individual users but it is owned by the organization itself and to access that data one should needs to consider the ones position in the organization hierarchy. The work presented above have also inspired to work further which is resulting in a role based access control (RBAC). Role based access control is basically a form of non-discriminatory access and also the recent texts of the security of computers mainly list the RBAC (role based access control) which is one of the three primary AC. The previous work on the RBAC as defined in the 1998 mainly defines the organized and the roles them into the system hierarchy. As seen over the last decade, the various researchers have developed or proposed the various models for the role based access controls. These assigned roles have been taken by the various users such as nurse, teller, manager and doctor. For example- consider a hospital system, where the main role of the doctor is to perform the various operations like medication, diagnosis and also the other laboratory tests. The primary function of an researcher is gathering of the anonymous clinical information for the purpose f study. These roles are mainly used for the control access which is an effective means of enforcing and developing specific policies for security and also for streamlining the process of security management. The main role of the user mainly establishes a session and activates some of the subsets of the roles which are mainly assigned to her or him. There are various permission which are available to the users in a particular sessions to all the active roles in that particular sessions.

The users under the role based access control should grant the membership to the roles which is mainly based on the various components and the various responsibilities within an organization. There are various operation that that needs to be permitted by the users for effectively performing the users role. The various roles of the members of users can easily be revoked and also we can establish a new member in which some of the new operations are mainly instituted and further all the old operations can be deleted easily. This is mainly simplifies the various administrative and management of the privileges where the roles can easily be updated without the use of privileges for each and every users which is based on the individual. The user is mainly associated with the role i.e. the user can be given one or more privilege i.e. it is much necessary to perform the various job. The least privilege concept is mainly required for identifying function of user's job which mainly determines the minimum set of privileges. In order to enforce the policies of CoI (conflict of interest) and the separations of the relationship of duty which are mainly used. CoI (conflict of interest) is basically a role based system which may arise as a result of the various users which are gaining the authorization for the various permission which are associated with the role of conflicts. These types of conflict of interest can be easily be prevented through static operation of duty i.e. in order to enforce the various constraints on the assignments of the various users to roles.

ACCESS CONTROL MECHANISMS FOR IOTs

IoT comprises the following three Access Control types:

1. Role-based access control (RBAC)
2. Credential-based access control (CBAC)
    a. Attribute-Based access control (ABAC)
    b. Capability-Based access control (Cap-BAC)
3. Trust-based access control (TBAC)

5.1. RBAC

Considering an emergency (for e.g. - a doctor is urgently needed after a traffic accident), the user's location should be accessible (under normal circumstances, information about the user's location that impinges on personal privacy should be kept confidential). In [12], the author mainly proposes an system which is based on the identity in order to manage information of personal location in the case of emergencies. This mainly includes registration, user authentication, policy, and a client terminal system. This will ensure only the certain authorized users who can access the location of users. The paper given in reference [20], Liu, et al., proposes AC (access control) and the authentication methods for internet of things. The authors in this method mainly analyze existing method of authentication and access control for designing a reliable access control protocol for internet of things. The protocol focuses on the process of establishing a simple and efficient ECC based security key. But, due to the highly dynamic environment and a huge number of users of IoT. The permission to RBAC cannot be assigned in advance and this method places a high toll on all the perception nodes in the entire process of communications. In addition to this, the reliability evaluation in the actual situation is not applicable. Thus, reference [23] modifies the protocol at the expense of safety and operational aspects based on reference [20], and analyze the performance of an improved protocol. The registration phase is included in the new protocol i.e. online or offline or login and authentication phase. In addition to this, a new protocol also incorporates password recovery and modification capabilities to help users manage passwords. Each user needs to be registered during the registration phase with the main registry, resulting in negotiation and calculation of the key parameters which is mainly between the gateway nodes and the users in the authentication and the log in phase. The analysis shows that the new method can meet the confidentiality, reliability, integrity and other key security requirements. But, due to the huge number of nodes and dynamic environment of IoT and limited computing and storage capacity of an IoT node, the applicability of these types of methods will be greatly limited.

5.2. CBAC

Traditional access control models like ABAC, ACLs, RBAC and ABAC due to their inherent limitations, cannot be applied directly to the Internet of things system. It has a great advantage and has been widely used in the traditional Internet. But, it cannot be applied directly to the internet of thins because it has the limitations of flexibility. The environment is very dynamic and the also there are huge number of users of the internet of things. Hence, the RBAC is not able to assigned permission in advance with the use of existing traditional methods. The process of ABAC is very complex and hence it cannot be applied directly the highly dynamic environment or real time environment of the internet of things and also the number of rules are also increases with the number of users. Nevertheless, RBAC and ABAC still have some advantages that can be exploited. The distribution problem can effectively be solved of competencies with time and location changes; while ABAC has the ability to solve the propagation problem of users. In [16], the author proposes a hybrid ACM (access control model) which is mainly based on the attributes and the role. The roles of this model are pre-assigned which is mainly based on the expression of property of the users and nodes. This model mainly proposes a property of the rule based language and the a solution to the conflict with the redundant policy. The authors use the Weichat App as an example to illustrate the feasibility of this model. This model is not enough in order to deal with the conflict of policy and also the redundancy processing as this model is still needs an administrator in order to manage their roles and the permissions license. Summarizing, this method requires further research to improve its usability. Due to the lack of the key validity in the current regime of the CP-ABE, the revocation management mechanism is the main shortcoming. Researchers found solutions for this shortcoming. In some of the solutions existing, there is a problem in the transmission and consumption of complexity. A strong trust is requiring with the other solution in order to decrypt the data. The paper presented in [31] proposes access control based on activities (Activity-based Access Control), which is a generalized version of context-aware, an account of the user context changes, with fine-grained features. The main aim is to make decisions based on perceived user stories and system status. A finite state machine can be used and also a By using a finite state machine and a Ciphertext-Policy Attribute-Based Encryption (CP-ABE) which is mainly an AEM (asymmetric encryption mechanism). A finite state machine can also be used in order to simulate a user state. In this, each of the object has an unique association with a finite state machine. Tis can be easily constructed from the system of design phase. The Attribute Authority is used for storage. The finite state machine contains all possible states of the system life cycle of the object and hence then specifies the change of object state which is based on the predefined time and the manner. The above program also taken into account the properties of real time of the RM (Revocation mechanism). The paper resented in [32] proposes a revocation mechanism called attribute-based CP-ABE, which is mainly based on a BM (batch method) and hence it can easily be reduced the process of complexity and the overall time of computation and also it does not need an additional nodes in th system. This paper has explained the division of timeline into equally spaced intervals. Access policy changes occur only on two consecutive time slots and it is only necessary to send one key for updating. Hence the solution in this paper can achieve the purpose of revocation. For maximizing the performance of system and also minimizing the waiting average time, the authors can easily analyze the method for the construction of optimal time slot. In [18], the author mainly focuses on PBAC (proximity-based access control, which is a new method for controlling the access. PBAC mainly uses the policy which is based on proximity with requesters and resources. The relationship is not limited to the physical proximity of adjacent elements. It is further composed of a number of adjacent elements: geographic location, organization, operation, business process, security risk, social factors, and other information. PBAC has to include an adjacent calculation function which indicates the relationship between these close properties. An extension of the ABAC is necessary to support fine-grained, flexible, context-sensitive access control policies based on proximity. In addition, the use of an MDS mechanism can be implemented to generate MDS and MDS certification automation strategies. Hence, ABAC can be more manageable and the policy of ABC will be much safer. This paper also focuses on the approach of policy management mainly by using the MDS and an extended ABAC with also a detailed example which involves intelligent transport system.

5.3. Cap-BAC

In [1], the author proposes an Cap-BAC which is based on the abilities of the existing model. The basic principle of this model is the least privilege which in turn is to manage an access to the different services and the information control process (ICP). In Cap-BAC, the user needs to show the service provider the authorization certificate prior to performing corresponding resource request operations. This is mainly emphasized on the availability of the security mechanism and also the correlation between the authorization access in addition to the requirement for the different methods which are accessible and understandable. In this paper, it mainly acknowledges the default principle which is based on the least privilege and it also controls the validity for a certificate of competency I order to provide security and flexibility for the practical applications. The solution of this disadvantage is that it mainly requires the ability to publish all the main certificates and also to have a selection capability always available whenever a body of certificate submits a request. In order to solve this problem, an authorized policy ability can be used for setting a specific set of services and then after generating the right of access for the authorized and recognized users. In addition, because other access control mechanisms must be developed under cross-domain or cross-enterprise environmental performance, they require the ability to standardize the structure of the certificate, whereas Cap-BAC's strongpoints are support services and an access control protocol. In [28], the author mainly defines a concept of UML model, which can be used for all the internet of things architectures and applications. The model takes into account the stage where users register with the IoT platform in the

handling of personal information and certificate exchanges in future interactions. It provides a new way of thinking about the management of registered users, things, and relevant certificates; however, there is still the need to establish a standardized and universally accepted solution. In [8], the author mainly provides a basic architecture of security for a secure support and for verifying the interactions which can be deployed easily on mobile platform. The Transport Layer Secure Sockets Layer (SSL) protocol is proposed mainly for the MHSP (M-Health Security Protocol), which focuses on the layer of application protocol for authenticating between the applications and the network. Hence, this can further provide a secure channel by using the PKC (public key certificate) which mainly includes identification of devices and the address of MAC for all the drivers of network. This architecture can easily be established when using the personal electronic health records. Further it can be used to manage the services of perception in a mobile environment. It is also joined together with a corresponding IoT context, for drug supervision management, medication control systems under special circumstances, analysis of the proposed security architecture and protocols, as well as medications to control ambient assisted living services (AALSS) in an IoT environment.

5.4. TBAC

The adaptive access control mechanism, flexible and lightweight is needed by IoT in order to deal with its universal nature and to ensure credible and reliable communication between devices. Reference [3] proposes the flexible trust perceptual characteristics of the access control system for IoT (TACIoT). This is mainly a lightweight mechanism which is designed basically for a model based on networking for trust in order to provide a reliable security mechanism from the start to the end in an Internet of things. TACIoT extends the traditional access control system and includes the value of trust which is based on the reputation, considering the security and the quality of service, and social equipment. This TACIoT has been implemented successfully in a practical experimental stage, which needs to be evaluated by using the unconstrained and constrained equipment of networking. Reference [22] mainly indicates that the traditional ACM (access control model) is not suitable for a distributed dynamic Internet of Things environment because the identity of these devices cannot be learned in advance. When two devices trust each other, they will be more willing to share services and resources. This paper proposes a method of access control (FTBAC) with a fuzzy trust value. The value of trust between the devices is calculated which is based on the framework of FTBAC — Experience, Knowledge, and Recommendation, are among the other factors. The value of trust can easily be mapped to the appropriate authority. The set of certificates and access requests are the access credentials. The FTBAC framework is mainly consists of three layers i.e. Device layer, which mainly includes all the internet of things devices and also their communications, Requesting layer, which is mainly responsible for collecting the information of Enterprise Knowledge Repository (EKR) and also calculating the trust value based on fuzzy, Access control layer, which mainly includes the mapping process and decision making for the value of trust and the access is based on the principal of least privilege. The result of simulation mainly shows that the framework can ensure flexibility, scalability, and more energy. In fact, a solution which is based on encryption protection can easily gain access to the controls mainly by increasing the trust level, and it requires an additional time and energy consumption. Moreover, the fuzzy method is more readily combined with utility-based decision making.

5.5. IBAC

This is a simple and practical access control model which mainly includes or it is associated with the access privileges of the specified users. The model proposed above is mainly consist of the four phases i.e. initialization registration, authentication and authorization and finally the revocation phase. In this paper, the SP has to play the role of KGC in the CLC environment [19].

5.6. DCapBAC

In [11], a distributed approach is mainly allowed by the DCapBAC. In this the constrained devices are mainly enabled within the logic of access control which is mainly done by considering the various mechanism for the IoT and suitable technologies. The access control system in this paper is mainly based on the capability of which is being tested and deployed in the social environment. The authors in this paper mainly focuses on the four stages of authentication enforcement which also involved the devices which authenticated mutually and they also have the token of capability which can easily be exchanged and then can be validated based on the request of the specific conditions

5.7. RFID access control

Reference [14] proposes a method to incorporate guest objects/things into IoT. In this paper the author developed a RFID system which is mainly based on access control system. The system developed above is also depending on network layer technology and the packet filtering. The above method mainly used a low cost and RFID passive tags which mainly attached to the objects in a virtualized representation, giving identity to the objects in IoT. Access control rights management in the Internet layer is analogous to a packet filtering firewall. So, the authors in the above paper have developed an ACS (access control system) which is mainly based on the filtering of packet which is mainly between the layers of objects and the internet. The system constructs a prototype RFID tag which is mapped to IPv6 addresses. The scheme uses network technology to replace the access control list of the RFID access control system to complete the communication system in the distribution of components. The huge address space of IPv6 can meet the huge amount of reader and tag entity needs. Through this example, the authors explain how the method is applied to the access control system which is mainly based on the open network protocol

and filtering of packet. This method mainly includes a new reader architecture of RFID in order to support the access control system which on the technology of layer networking. It includes independent storage access control rules. Only when the rule needs to be updated, do reading devices need to communicate with the server. Rules can be updated by the multicast method. In the same security zone, multiple reading devices can distribute safety rules at the same time, thereby improving the efficiency of rule updates.

5.8. Key management in Access Control System

In [6], the main focus of the author is to authenticate and controlling the access within the framework of IOT, which is mainly for the various constrained devices. These constrained devices mainly include the PUF (physical unclonable function) and eSIM (embedded subscriber identity module). The function of PUF is mainly to provide an inexpensive, safe, and tamper resistant key in order to verify constrained M2M equipment, and the main function of eSIM is to provide a interoperability, compliance within the protocols of security and SMCM (scalable mobile connectivity management). The paper presented in [33] mainly describes the use of a shared key to multiple communication terminals (denoted as the group key) as the method to protect the security of the multiplex. The key mainly consists of a centralized approach to management and distribution of the batch. This program mainly reduce the computing consumption and network transmission resulting from changes in group membership as users come and go from the network. The paper presented in [21], it mainly focuses on AC (access control) for a data acquisition layer, while taking into account the all the storage capacity of the nodes and limiting the computing. The above scheme discussed provides each user and node with a single key and then uses the confirmed key generation algorithm to calculate additional keys as per needed. The exchange of key is limited, and the function of the above scheme is to mainly improve the safety while reducing the consumption storage by the nodes. The paper presented in [26] develops a rapid adaptive network access control method for LLNS (low-energy lossy networks. LLNs mainly contain the thousands of embedded network devices, which are mainly connected to large network architecture. They can be further used for various applications and which produce a new concept of Internet of things. A bottleneck effect at the router border, which may leads to the bandwidth waste and slower completion of identity verification. In this paper, a low energy lossy and very fast adaptive network technique is presented which is called finally an it also allows the device for authenticating once again after a failed attempt and also a custom selected waiting time. The unnecessary waste of latency and bandwidth can easily be eliminated. The linear arrangement can be created with reduced waiting time for every terminal space in time and thereby avoiding the congestion and various unnecessary delays for the whole network. The above technique can easily solve the various problems and also improve the speed and efficiency of the authentication process. The result of simulated evaluation results show that it can guarantee fast authentication devices and avoid repeated validation failure, thereby reducing unnecessary consumption of transmission, and improving the time of the verification process. The paper presented in [7] proposes novel key techniques for multi-hop wireless networks for IoT. There are mainly three key techniques included i.e. network tomography, network division and traffic scheduling, which support the network resources optimally and dynamically managed among these networks to meet all application requirements.

5.9. Real-time transport control data collection

Real-time information collection with IoT in the external environment is more convenient and more effective. In [17] it proposes a new IOT to the outside world of information AC (access control) mechanisms in order to build a real-time database, which can easily be avoided congestion of communication. In addition, it provides mathematical methods to improve the efficiency of the optimization method. The mechanism is set dynamically according to the change rate of the transmission time of each of the terminals on the external environment. To set a message transmission time, the terminal needs to periodically check the current information on the outside of the terminal and be set to a rate of change between the information servers. When the change rate is higher than a predetermined threshold, the execution information transmission process begins. In order to optimize the process, ensure a real-time database and avoid blocking the transmission case, the authors also provide a mathematically optimal method of setting the threshold value.

5.10. Trust computing in IoT

The trust management systems and the computation model system have been successfully implemented in various commercial applications [34, 15]. The literature is growing very rapidly around all of these topics of reputation and trust management. The main motivation behind initiating a trust model of computation is mainly to prevent discriminatory or malicious attacks from the various misbehaving nodes. Misbehaving nodes may also comprise the various integrity and the QoS (quality of services) which is provided by the Internet of things devices in an integrated environment for the health and medical care. It is very important to establish a trust among the various devices and also the various strategies which is mainly for building a good reputation. This is mainly based on the mechanism of trust for the IOT devices which are for the health care that needs to be effectively done with malicious behavior of the certain types which also needs to other leading nodes. In [5], trust-related attacks mainly include: 1. Self-promoting attacks, which promote their own credibility through the illegal means; 2. Bad-mouthing attacks: which greatly reduces the trust value of good nodes; 3. Ballot-stuffing attacks, which are for boosting the reputation of malicious nodes; 4. Opportunistic service attacks, which mainly raises their own reputation through providing quality service in a random manner; 5. On-Off attacks, which mainly provides poor services intermittently. Recent work in conducting the survey for most relevant available solutions to trust management, frameworks and the

models [15, 34, 29]. The main motivation of this paper presented above is to identify the trust management frameworks which are suitable for IoT applications in the area of medical and health care. Especially, we are interested in trust value computation and trust value propagation in different the types of the frameworks. In [30], the author suggested that a trust is a basically a relationship which needs to be established between two entities for a performing a specific action. They also introduced a notation i.e. subject, agent, and action in order to describe a trust relationship between two entities. Under this relationship, the trust is the main function of uncertainty. The level of the trust is measured by a continuous real number.

CONCLUSION

The Internet of things (IOT) is mainly a hyper connection of person machines, and data to the internet and information is also generated, utilized, shared and exchanged among the devices. Each of the devices of Internet of things has some virtual address. Each device can exchange information. IoT is very vague and consists of highly heterogeneous devices that need access control mechanisms to talk, share and utilize each other systems. These information exchange needs to secured and free from malicious corrupted data. Proper preventive systems needed to make devices secure from unauthorized access. So it is preliminary requirement to secure user's identity and transmitted data between IOT devices. The principal elements of the IOT are the Access control and the authentication. Cheating is the main problem associated with the IOT. The principal question that needs to be asked trusts the validity of the data generated. But the problem becomes inherent, when the question is to embrace or not embrace the main idea of open source software and the open platform. There are various new fields of controlling techniques for accessing which mainly includes TC (trust computing), AC (access control), IoT (internet of things), cheating technologies and the network attacks. It is therefore needs to improve the trustworthiness before using it to solve the challenging environmental and economic problems which are tied to all our social lives.

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