

Implementation of Secured Smart City Design using Overlay Network

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Abstract - Overlay networking is a software oriented technique to create multiple layers of network abstraction that may be used to compute or run more than one separate, discrete, digital network layers on tangible network, often imparting new applications or safety benefits. The essential concept of overlay is implanted within the ancient computing paradigm of virtualization. In which the internet service were architecture to provide the exact necessities of such modern and innovative distributed applications. It was designed as a heterogeneous web of networks, and its method permits diverse entities to interact with every other in an exceptionally special framework. An IOT (Internet of Things) specific application platform is a virtual framework that locates over virtual cloud. In the usage of cloud connectivity, here IOT platform converts such device data into appropriate information. So it offers a better consumer approach to implement future smart city infrastructures and enables predicting maintenance, real time data management and analytics. In this paper, we use IoT intended for bringing value to the Fog computing platform. To say on IOT networking operation it enable more security, latency and efficiency of the application and also generate the basis authorizing assimilation of present vertical city offerings into an all- enveloping system. It access new skyline for the development of the effectiveness and viability of our cities.

Keywords: - *Overlay, Fog Computing, Smart city, Security, IOT*

I. INTRODUCTION

Considering the digital era, Internet is revolutionizing in each perspective of communication in human society by permissive a broad applications in sort of commerce, business, news, entertainment and social interaction. Modern applications need high reliability, security, performance and scalability yet require to be advanced rapidly and viable at minimum operating costs. However, the Internet service has been never architect to provide the stringent requirements of such modern and futuristic distributed applications. Now a days Internet is a huge crowd of more than 13,500 autonomous networks that usually contest for business. Failures and accomplishment deterioration in transporting data along this crowd are habitual occurrences. Thus we had stepped up to modern internet based service due to overlay network.

An ON (overlay network) is an essential network of nodes as well as logical links this is designed on apex of a pre-

existing network to favor the purpose of enforcing a network service that isn't available in the present network. Along the similar lines, we can construct a virtual network (the overlay) over the existing Internet (the underlay) to arrange the tight need of current Internet-based services which is shown in figure 1. Overlays are used in the working network that the underlay has to offer. In flip, the overlay provides richer capability to offerings which might be built on topmost of it.

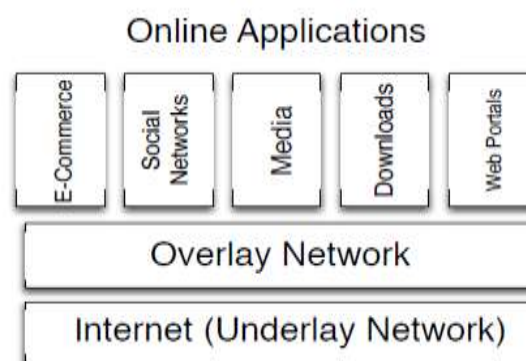


FIGURE 1: Overlay network on top of public Internet

A. Types of overlays

Different overlays offer different improved functional activity for networked services. As referred, there are abundant varieties of overlays based on provider requirements. However, our purpose is not to be comprehensive. Rather, we simply evaluate the following 3 types of overlays which are illustrated and vital for assembly the uses of Internet-primarily based services:

- 1) The ubiquitous caching overlay that pursuits to deliver net sites, on demand software downloads, song and video downloads and various forms of online content. Those overlays are applicable for content that doesn't trade over prolonged intervals of time and is consequently catchable. The key advantages that a caching overlay gives are more available, starting place offload, scalability and performance.

- 2) The overlay network that gives huge area transmission with greater reliability, low latency, and more throughput than the public Internet. Such overlays may be used to supply dynamic web content or stay movement content that generally can't be cached.
- 3) The security overlay that increment the safety and checks intrusion on web sites and other networked services. Those overlays are at the root of some of the most desired assistance, as long as at the similar time they are a typical example of the overlay philosophy for upgrading the underlay by implementing new functionality.

As we discuss the design and techniques of every type of overlay, it is essential to recognize that these overlays are frequently used together as a section of a single solution. We utilize this overlay network on the IOT platform to advance the effectiveness and performance of the network in the applications.

IOT can communicate with devices embedded in numerous systems to the internet. When devices or commodity can serve themselves virtually, they can be maintained and controlled from anyplace. The connectivity, then help us seizure more information from more places, assure more ways of expanding adaptability and developing protection towards IoT security. IOT will switch the data world and technology world immensely to create a more appropriate world full of technology. Numerous prototype hardware boards, RFID, sensors, chip systems and universal networking capacities are supported aspirant for IoT evolution [1].

When advancing any application, Platform is the primary model which allows us to set up and run the application. A platform is the combination of both hardware and software suite upon which other applications can function. The platform consists of hardware above which Operating System (OS) can locate. This OS will permits applications to perform above it by serving the essential execution setting to it. This is known to be an IOT platform serve on a overall set of generic, i.e. application liberated functional design which can be utilized to create IoT applications[2].When there's only one connective hyperlink between devices of a kind with another device of the identical type, then a system of precise provider may be installed. But in case of connection among devices of numerous types, there is a requirement of some usual typical application platform which conceal heterogeneity of many devices by servicing a usual occupied status for them. An IoT platform is a virtual solution process, it consists over cloud. Data is the individual entity that drives another device. So it serves consumer in different way to appliance business that utilize cases and allow predicting maintenance, analytics, pay-per-use, and real time data management.

IoT platform is an overall suite of providers that benefits, services like improvement, support, and distribution of analysis as well as intelligent conclusion making capacities to an IOT application. Numerous IOT platforms are today available which can be utilized for advancing requirements, but here we have deliberated the greater effectiveness and securable of Fog computing platforms that switch dynamically if the network state switch in areas like link bandwidths, fault events, processor loads, security threats, storage capacities, cost targets, etc..

Fog computing platform cross cutting interest on security, control of execution, proficiency and inactivity are additionally imperative to the achievement of fog computing systems. Certain capacities are commonly increasing gainful to achieve in fog hubs, while others are better fit than cloud. The typical back end cloud will keep on persevering through a key piece of processing frameworks as fog registering emerges. The dissemination of what capacity lead to fog and what goes to the back end cloud are applications specific. Upholding wellbeing and security in fog situations that have more than one master and clients. Structuring and settling validation and underwriting methods that can work with various fog hubs that have distinctive figuring limits is troublesome [3].

Fog computing relies upon Stream Control Transmission Protocol, that organize packets and activity unwavering quality in remote sensor systems [4]. Urban communities are utilizing innovation to manage different difficulties, comprehensive of traffic blockage, open security, vitality utilization, sanitation, and open web availability. By bearing safe information and appropriated investigation, fog processing complete a crucial job in tending to open security and wellbeing worry for keen urban areas [5].

II. RELATED WORKS

The quantity of smart things is developing exponentially. By 2020, billions of things might be spread the world over, gathering a plenitude of different experiences. Standard enlisting styles a mass in field records and a short time later move it to a fundamental estimation network where assessment are done to it, yet that can't be a useful model. New philosophy and new development are required to change basic proportions of amassed records into critical real factors. Advancement will in like manner engage the interconnection around things inside the IoT condition, at any rate similar assessments are required in the improvement, blend and interoperability of the specific IoT factors. At this moment, offer a depiction of the fundamental mechanical added substances expected to allow the interconnection among things as a way to deal with see IoT gauges and applications [6].

With the advent of the IoT, huge realities systematic and distributed computing administrations give upward push

to more prominent expansiveness inside the assessment of additional calm figuring situations, better asset control and weakness examination. So as to suitably explore the defenselessness of Bluetooth low power (BLE) Wi-Fi people group empowered IoT frameworks, we must propose a novel strategy to broaden the figuring technique for authentication which is one in all factors utilized inside the conventional base rating conditions of the CVSS (Common Vulnerability Scoring System) proposed through NIAC (National Infrastructure Advisory Council). Through an occasion BLE Wi-Fi arrange have checked the shaky area of the present day CVSS base score conditions and the best approach to beat the powerless point over our augmentation [7].

The IoT and information investigation are coming all in all [8] to shape the accompanying influx of the mechanical upset. By interfacing numerous gadgets that have been prepared with various assortments of sensors to the net through a remote system, IoT frameworks will create another range of records on the web and effect the entire universe of enormous records. Bluetooth Low Energy (BLE) [9] organize age is presently ascending as the low-vitality remote age of inclination in loads of IoT applications [10, 11]. As a chose model, examining an imaginable genuine world IoT framework that utilizes unconstrained Wi-Fi hyperlinked organize [12]. The idea of game plan structure on one system overlay over some other one (underlay) is at least contrasted with decades old. Actually, the early Internet of the system become itself at first worked as an overlay on the phone arrange that changed in the central system of the day. The most significant partition of the previous overlays had been worked to offer usefulness that the underlay locally needed. An overlay ready to conveying content material, applications, and contributions to a universal objective crowd is a huge distributed framework, for example, heaps of thousands of overall sent servers that run complex calculations. Autonomous of the exact kind of overlay, the rate a comparative framework structure [13].

Fog Computing is particularly proposed for IoT programs which may be Geo-spatially dispensed, enormous scope, and inertness. This has presented new investigations requesting circumstances continuously and adaptable provisioning of IoT contributions dispensed across Fog-Cloud figuring structures. Information driven IoT contributions, as a prevailing sort of IoT contributions in huge scope arrangements, require configuration answers to accelerate information preparing and notice, and scale up with the realities degree. Right now, recommend a bearer arranged plan engineering that for the most part centered on provisioning and taking care of realities driven IoT administrations done over Fog-Cloud structures. In the proposed plan, records-driven IoT administrations are set up in a supplier taking an interest tree structure, seeing to the various leveled mist essentially based IoT processing designs. A bearer hub inside the tree is engaged with abilities for ongoing supplier records notice, nearby realities preparing and multi-degree IoT

insights get admission to. The fundamental impacts show that, along the design advantages of the proposed variant, it doesn't force any additional overhead when contrasted with cutting edge [14]. The intersection of the IoT and the cloud, in huge part empowered through the fundamental of IoT applications to use the versatility, execution, global bearer availability, and pay-as-you move capacities of mists. It became to be simply significantly progressive troublesome with the advancement of fog computing stages, bestowing versatile assets and administrations at the edge of the system [15].

III. PROPOSED APPROACH

In a fog computing infrastructure, end-to-end security must cover everything between the cloud and the things on the outline of the network. In the architecture, security starts with the individual fog node hardware.



FIGURE II: Fog computing infrastructure

In the event that the hub can't with the proper security to guarantee that it is a confided in component, it is preposterous to expect to construct a dependable start to finish haze processing framework. When confided in fog hubs have been sent, a safe fog system can be layered on the hub framework, giving the premise to make sure about hub to hub, hub to thing, and hub to cloud correspondence. Figure II shows a fog registering framework that is free of the cloud. This model might be relevant for use situations where cloud can't be utilized for reasons, for example, low occasion to activity time window, administrative consistence, military evaluation security and protection, and inaccessibility of a focal cloud in a specific geology. Models incorporate military battle frameworks, ramble activities, some medicinal services frameworks, emergency clinics, and ATM banking frameworks.

A. Planning Goals

There are different planning objectives for a reasonable fog processing stage.

Inactivity: It is basic for fog processing stage to give end shopper low-idleness ensured administrations and applications. The inertness originates from the execution time of a task, the endeavor offloading time, the ideal opportunity for digital searching and speed of choices making, etc.

Productivity: While from the outset the proficiency may have its own effect on inertness, it is progressively identified with the proficient usage of assets and vitality. The rationale is open and totally unmistakable from the match in distributed computing situations:

- 1) Where all fog hubs are not asset rich; a couple may have restricted calculation potential, memory and capacity.
- 2) Most of fog hubs are battery-controlled, for example, requirement gadgets, remote sensor units and wearable.

Simplification: Due to the assortment of fog hub, we need offer indistinguishable theoretical to top layer bundles and contributions for fog customers. General APIs (Application Programming Interfaces) ought to be outfitted to address current conventions and APIs [16].

B. Difficulties

It is basic to make fog handling stages to meet recently referenced targets. We should perceive a couple of challenges referenced underneath.

Security and Privacy: We give up that security and insurance must be considered at each period of fog figuring stage structure [17]. Moreover, we saw that one of the immense troubles looked by fog enrolling. To overcome this, we need apply get the opportunity to control and interference revelation structure, which need support from each layer of the stage.

Fight with Latency: There are various factors introducing high idleness of an application or organization performed on fog enlisting stages. High inertia will pulverize the customer experience and satisfaction, since murkiness enrolling is engaged at delay-delicate applications and organizations. There are a couple of possibilities to get dormancy in fog figuring:

- a) **Data assortment:** The Geo-appropriated nature of fog figuring perspective confirms that there will be delays if data absolute can't before data dealing with. In any case, there are various ways to deal with alleviate this issue, for instance,

applying data partitioning/isolating and utilizing region in hierarchy to lessen the computational volume on higher layer.

- b) **Resource provisioning:** There will be delays in provisioning resources for explicit endeavors, especially for resource limited fog center points. We may require meticulously organized arranging by using need and compactness model.

- c) **Node convey ability, disturb and frustration:** Fog figuring ought to be adaptable to center point adaptability, mix and dissatisfaction. Both structure screen and region organization will coordinate to offer information to help rescheduling, enlistment and replication.

Trust Model: Fame basically based trust model [18] has been an accomplishment in circulated (P2P), eCommerce, client considers and on-line casual networks. Damiani et al. [19] proposed a ground-breaking differentiation contraption for resource choice in P2P frameworks utilizing a passed on looking over count to survey the steadfast nature of an advantage sooner than downloading. There are also accepting models subject to uncommon gear, for instance, the Secure Element (SE), Trusted Execution Environment (TEE), or Trusted Platform Module (TPM), which can give trust utility in dimness figuring applications.

Dissident Fog Node: A renegade fog center point might be a fog contraption or a dimness model that professes to be certified and convinces stop customers to join with it. For instance, in an insider ambush, a fog administrator can be affirmed to control murkiness times, yet may in like manner fire up a dissident fog case as opposed to a real one. Work [20] has set up the credibility of man-in within ambush in fog figuring, as of now which the entrance ought to be either agree or displaced through a sham one. At the point when related, the adversary can control the drawing nearer and cordial requests from stop customers or cloud, gather or modify singular estimations covertly, and without issues release equivalently ambushes. The current of the fake fog center point will be a colossal hazard to customer records protection. This trouble is hard to oversee in fog preparing due to different manners of thinking

- 1) **Complicated consider circumstance** requires stand-apart agree with the board plans,
- 2) **Dynamic progression,** deleting of automated contraption event, makes it outrageous to shield a blacklist of nonconformist center points.

Affirmation: Authentication is a fundamental issue for the security of fog handling, seeing that organizations are given to tremendous degree stop customers by strategy for front fog center points. Stojmenovic et al. [20] have considered the crucial prosperity issue of murkiness figuring as the approval at indisputable degrees of fog centers. Standard PKI-based

totally affirmation isn't continually green and has terrible flexibility. Balfanz et al. [21] have proposed a reasonably assessed, quiet and customer flawless system to the confirmation trouble in neighborhood exceptionally delegated Wi-Fi society, depending on a physical touch for pre-approval in a locale restricted channel. So additionally, NFC in like manner can be used to encourage the confirmation method inside the occurrence of cloudlet [22]. As the progression of biometric affirmation in appropriated registering and cell handling, close by face check, one of a kind finger impression approval, contact based totally or keystroke-based completely approval, etc., it will be essential to use biometric based affirmation in fog figuring.

Framework Security: Due to the predominance of remote in fog sorting out, Wi-Fi social order affirmation is a colossal concern to fog computing. Model ambushes are staying attacks, sniffer assaults, and various others. Those assaults may be tended in the investigation space of remote framework, which isn't commonly inside the degree of this examination. Customarily, in the framework, we have to acknowledge the arrangements genuinely created by strategies for a framework director and separate sort out control traffic from traditional estimations visitors [23]. Regardless, fog center points are sent at the edge of the Internet, which for all goals just as purposes convey overpowering load to the framework control, imagining the advantage of keeping up tremendous degree cloud servers that are scattered wherever all through the system zone without clean access for security. The selection of SDN can clear the movement and the officials, and improvement orchestrate flexibility and discover costs, in various parts of cloudiness enlisting. We furthermore fight that applying SDN technique in cloudiness figuring will pass on fog sorting out, security late troubles and possible results.

IV. APPLICATION

Smart city representation brings creating unique association advances, for example, Fog Computing (FC) formed to broadly diminish the inertness and vitality devouring of IoT gadgets running various applications. The brilliant city idea emerges from the possibility of productive utilization of city assets for upgrading residents personal satisfaction [24], as the pace of urban living has as of late quickened. In structure to achieve a superior personal satisfaction, improvement of administrations and foundation in urban areas must be considered. Because of the transformation in information and correspondence innovation and the intensity of the Internet [25], frameworks and open administrations are assessed to be further intelligent, available and extra effective as we move towards the knowledge of brilliant urban communities. Right now, advancement of the IoT worldview firmly energizes use

of the IoT's capability to sponsorship the shrewd city vision around the globe.

As an outcome, the smart city has created a significant IoT application drivers. Shrewd urban areas IoT structures advance the idea of interrelated physical items (things) which can be extraordinarily analyzed and circulated over colossal substantial territories ensuring an entire city. As of late, the IoT idea has stepped toward interfacing 4 columns things, data, strategy, or even individuals as the IoE (Internet of Everything). From one demeanor, towns can be appeared as a collection of interconnected systems that creates IoE. Consequently, the IoE columns play a generous position and work together near the limit of our smart town vision for what's to come.

The primary meaning of FC gets presented through Cisco [26]. In particular, we accept that the administrations and segments occupied with shrewd urban areas ought to receive rising advances. They incorporate different kinds of interchanges between the parts and compute the introduction of our answer on genuine datasets.

A. Fog-Computing Smart City network

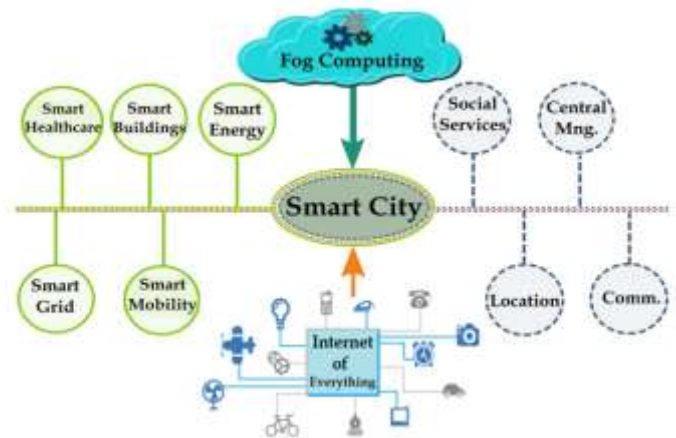


FIGURE III: High-level view of the smart city model

The gadgets are associated by means of the Internet marked as IOT, see the parts at the beneath .Without loss of simplification, Figure III presents an elevated level perspective on the keen city. The gadgets in the keen city condition utilize various administrations, for example, intercommunication, versatility, matrix, vitality, etc. These exercises will encourage the occupants' nature of life expectancy and improve the effectiveness/execution of administrations in accomplishing their requirements.

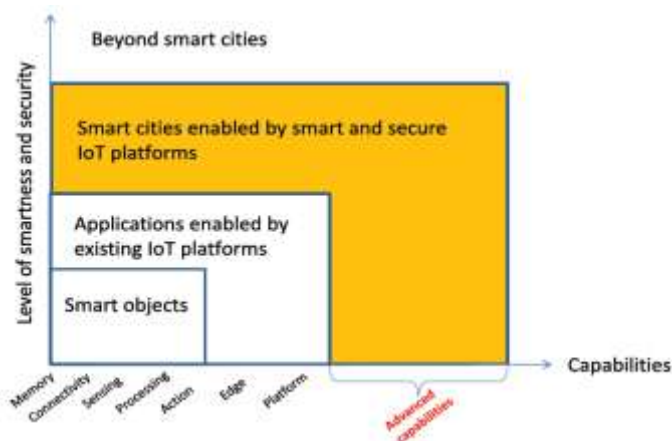


FIGURE IV: Smart City framework with smart IoT platform

The above figure brilliant items are conveyed later on city. Those articles have essential capacities of memory, network, detecting, preparing and activity. With the essential capacities, encompassing data, versatility, vitality or water use, video streams, traffic data, and so forth in the city can be seen. In the meantime, each brilliant article can be associated with various keen items and different elements, for example applications and administration stages for empowering a Smart City.

V.CONCLUSION

Fog computing leads viability to the application of smart city. In this work, we have analyzed and evaluated fog computing platform is a machine-stage horizontal design that distributes assets and use of computing, storage, control and networking everywhere along the range from Cloud to Things, thereby accelerating the rate of decision making. Fog-centric design serves a specific subset of enterprise problems that can't be effectively carried out the usage of only traditional cloud primarily based architectures or entirely wise part devices. Our findings certainly spotlight the significance of fog computing structures with a purpose to build supportable IoT infrastructure for smart cities.

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