Dynamic Key Switching Integrated Scenarios for Performance Aware Implementations in Cloud and Integrated Internet of Things

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Abstract: ***With the adoption and wide usage of smart gadgets and devices for multiple applications, the association of advanced technologies is quite prominence and needs higher degree of accuracy and performance. These are legitimately connected with the advanced innovations including Internet of Things, Internet of Everything, Internet of Vehicles, Internet of Cloud Apps and numerous others. This original copy is therefore displaying the enormous issues and research focuses in this area with the associated streams so the different elements of IoT, IoE, IoX, IoV and others can be broke down with the examination openings and the portions for various streams. In the present situation, the IoT based coordination of digital forms of money is very unmistakable whereby the distributed system is pursued and it goes under the innovation of blockchain. The blockchain innovation is likewise connected with the shrewd advances. In the present period, Blockchain Technology is one of the key territories of research just as execution explicitly in the space of cryptocurrency. Presently days, various computerized cryptographic forms of money are very conspicuous and shared all through the world in spite of tremendous analysis and discussions. Other than these purposes of research, the vehicular mix of IoT is very conspicuous that is tended to utilizing IoV that is Internet of Vehicles in the keen traffic observing and brilliant transportation. Presently days, the IoT is moving towards IoE or IoX which alludes to Internet of Everything and this is additionally tended to in this composition. The manuscript is presenting the scenarios for the implementation patterns associated with the security and dynamic key based environment.***

Index Terms: ***Cloud Security, Dynamic Security, IoT Security, Network Security***

I. INTRODUCTION

Internet of Things (IoT) is one of the key domains of research with the higher degree of adoption throughout the globe for multiple segments including engineering, corporate, social, personal and related automation [1, 2].

In this the sensor technologies are used so that the devices can be able to communicate with each other [3, 4, 5].

The classical technologies associated with IoT [6, 7] are

- Internet of Cloud Apps (IoC)
- Internet of Everything (IoE)
- Internet of Vehicles (IoV)
- Cloud of Things (CoT)
- Cloud of Everything (CoE)
- Internet of Humans (IoH)

and many others

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Global Aspects of IoT: The IoT and CoT are now days widely implemented including the advanced scenarios of smart cities and smart automations in different countries with the advanced wireless technologies.

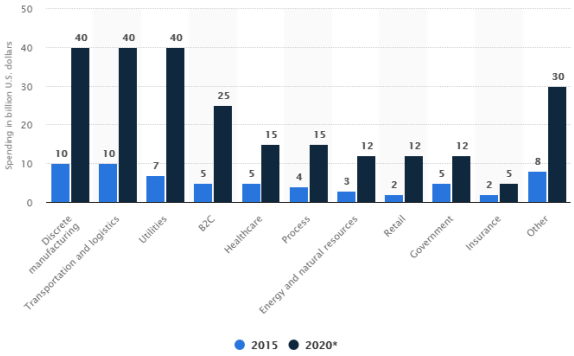

Figure 1: The Elevating Market (Billion US Dollars) of IoT Worldwide

(Source: Statista, Statistical Research Portal)

The novel concept of Internet 4.0 is directly integrated with the smart manufacturing with the usage of IoT technologies. In this technology the usage of sensor based data aggregation and processing is done with the higher degree of accuracy.

The association with smart devices for government and corporate applications need higher level of accuracy and performance and for this the integration of decentralized applications is required [8, 9]. In case of IoT, there are multiple devices connected with each other but should not be controlled from single location or centralized servers. The main limitation with centralized approach is that if that centralized server is hacked then everything can be damaged or copied from that server. In case of decentralized application, there is no single server rather storage is done on all the client devices so that the replication of the transaction can be done with maximum availability of transaction records [10, 11].

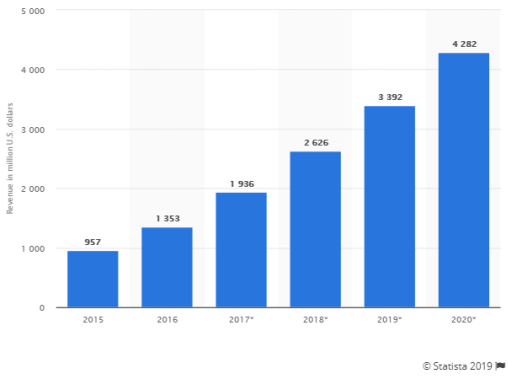

Figure 2: Revenue from Cloud Services in India 2015 to 2020 (in million U.S. dollars)

Following are the Tools and Technologies for Implementation of Cloud and IoT based Environments

- Contiki: http://www.contiki-os.org
- OpenIoT: http://www.openiot.eu
- Zetta: http://www.zettajs.org
- CupCarbon: http://www.cupcarbon.com
- Node-RED: http://www.nodered.org
- IoTivity: https://www.iotivity.org
- KAA: : https://www.kaaproject.org
- DSA: : http://www.iot-dsa.org

Features of Contiki Cooja based IoT and Cloud based Scenarios [12, 13] includes the following aspects

- Back-End C Code
- Low Power Operations with ContikiMAC
- IPv6, IPv4, Low Resource, Protothreads, Microcontrollers, Game Consoles
- Sensing as a Service (S2aaS)
- WebSocket (Low Overhead, Real Time on TCP), Reactive Programming
- Inter-Device Communication , Logic and Apps on All Layers
- Flow based Programming, ~2.5 Lacs Modules
- On-Board, Constrained Application Protocol (CoAP) as application layer
- Smart-City, SCI-WSN Simulatior, 2D-3D OpenStreetMap Visualize
- Data Analytics, Dynamic Updates in Real-Time
- Client-Server Module with claimed World's smallest browser
- Support for Integration with Hardware
- Free and Open Source Platform for IoT and CoT
- Sleepy Routers (Battery-Operated Wireless Routers)
- 6lowpan, RPL, CoAP
- Full IP Networking, Inter-Process Communication (IPC)
- Proto-Threads (Multi-Threading + Event-Driven Programming)

II. PROBLEM STATEMENT

As the advanced wireless networks are susceptible from different assaults, there is need to integrate the higher degree of security and integrity based algorithm with the implementation aspects. The presented work is depicting the secured IoT based environment for the advanced cloud and IoT environment.

III. OBJECTIVES

Following are the research objectives associated with the manuscript

1. To identify the vulnerabilities and security aspects with the advanced IoT and cloud based environment
2. To work on the security paradigms and the implementation aspects
3. To implement the security aware approach using Contiki Cooja based platform

IV. METHODOLOGY

Implementation Perspectives and Outcomes

Using the Contiki Cooja based simulation environment, the following outcomes are fetched with the integrity and security aware scenarios on cloud and IoT based environment.

V. IMPLEMENTATION

The Link failure model is emulated by using Unit Disk Graph Model (UDGM) in Contiki Cooja with the usage of two different range parameters one for transmission and one for interference with other radios.

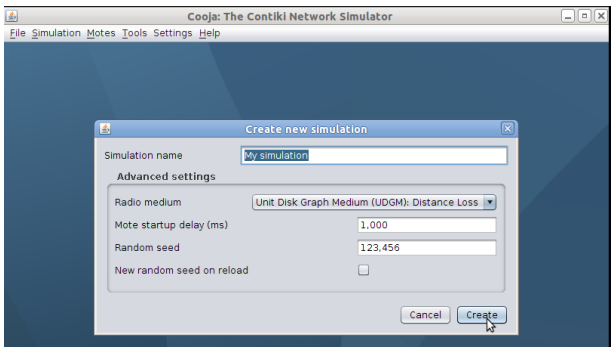

Figure 3: Setting Up the Parameters in the Contiki Cooja

The bigger Green Circle -> Transmission range (R) of node 1

Gray Circle -> Collision with other radios.

Percentage ->

- Reception Ratio of the transmission between node 1 and 2.
- The node 3 is inside the collision range of node 1.

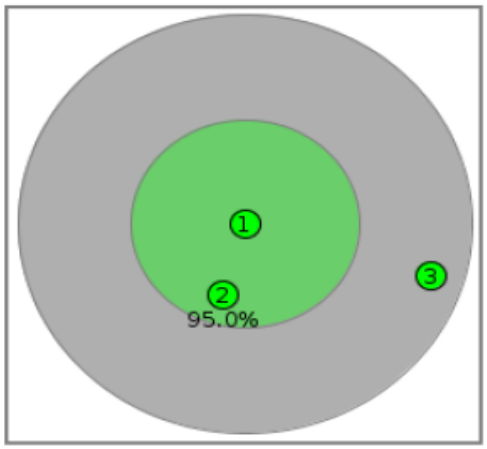

Figure 4: Setting Up the Radio Medium in the Cooja

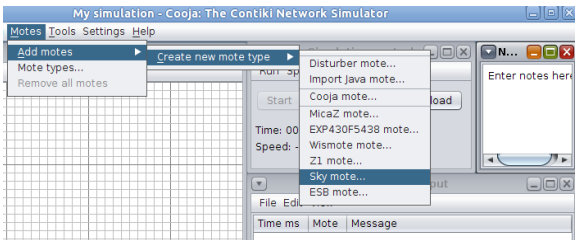

Figure 5: Insertion of the Motes in Cooja

The Cooja Simulation is having the multiple types of motes which can be inserted including the following so that assorted implementation patterns can be simulated with different types of nodes

- Z1 Mote
- ESB Mote
- Sky Mote
- EXP Mote
- MicaZ Mote

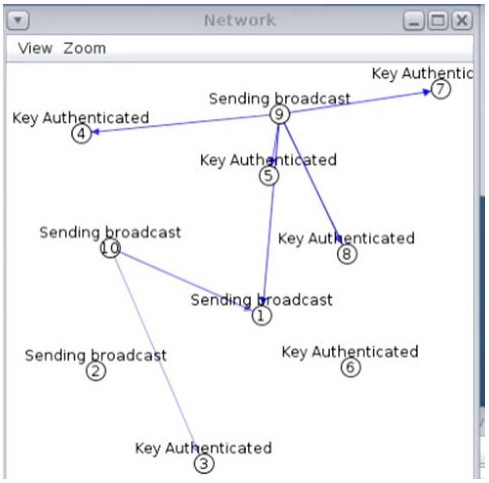

Figure 6: Execution of Broadcast and Secured Key Exchange

As depicted in the above mentioned, the dynamic key exchange is integrated so that the overall communication in Cloud and IoT based environment shall be security aware and overall performance can be augmented to higher degree of performance.

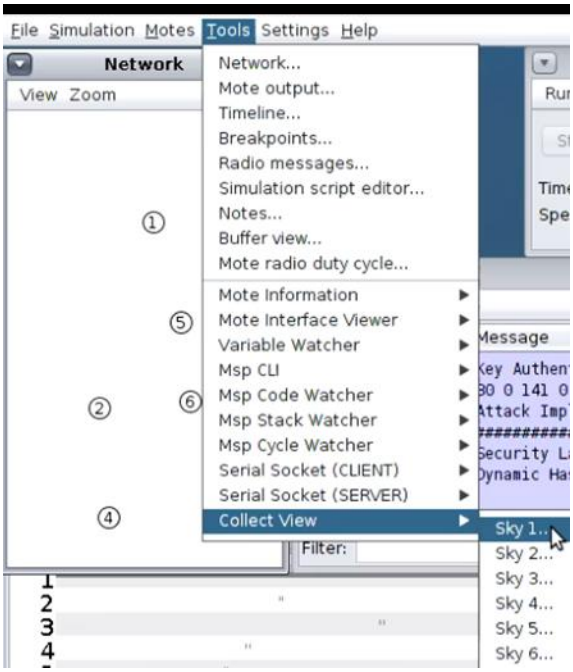

Figure 7: Analysis of the Parameters in the Sky Motes

The detailed and cavernous analysis of the parameters can be evaluated on assorted parameters.

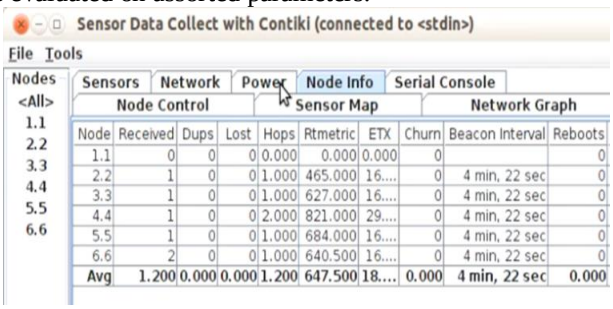

Figure 8: Presentation of the Tabular Results in Contiki Cooja

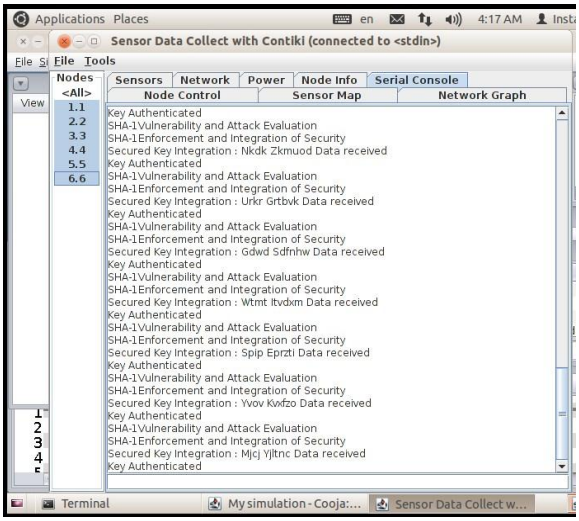

Figure 9: Fetching the Secured Key Exchange Process

The scenarios of smart cities and the huge implementations for IoT and CoT can be generated so that the analytics of different factors and protocols can be done.

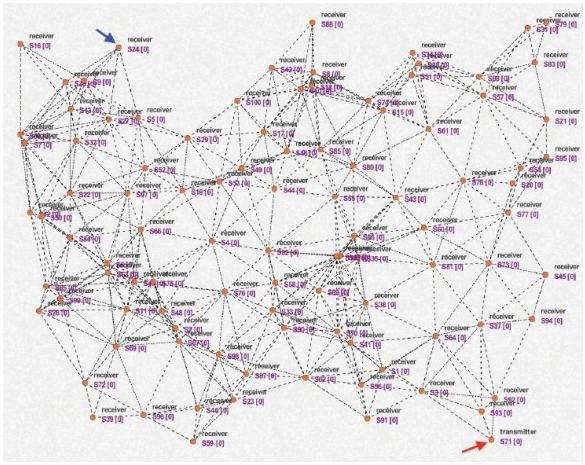

Figure 10: Generating the Smart City based Scenario

As shown in the figure, the smart city based scenarios can be created and simulated using IoT and advanced cloud based tools.

VI. LIMITATIONS

The work associated with the advanced IoT and cloud based environment can be further elevated with the usage of nature inspired algorithms and soft computing approaches so that the further enhancements can be done.

VII. CONCLUSION AND ECOMMENDATIONS

The rampart growth of mega and huge-cities without secured IoT and CoT is meaningless, unless there is some system in place for these cities to be called actually smart, by being efficient, reliable and chaos-free which can be having dynamic and smart key exchange. This can only be achieved by making these cities intelligent, instrumented and interconnected by incorporating the latest and advanced applications based on IoT. This includes the integration of features like smart services, smart management, smart industry, smart technology etc.

by installing sensors with Radio Frequency Identification (RFID), Infrared (IR), Global Positioning System (GPS) etc. for all the services and connecting these to the internet, so as to achieve the desired outcome in terms of intelligent identification, co-ordination, navigation and surveillance etc. In this manuscript, the dynamic key exchange process of the IoT based environment with cloud integration is presented so that the overall scenarios can be implemented with higher degree of security and integrity. To have the elevated degree of performance, the integration of soft computing algorithms can be done.

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