Improving Security Management in a Multimedia Environment using The Block Chain Technology

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ABSTRACT

The goal of this project is to use block chain Technology to improve security management in a multimedia environment. Portraying the Star Times multimedia network under study, which is located in Enugu, Enugu state, Nigeria, determining the performance of the network without threat, determining the performance of the network under threat, developing a block chain algorithm to detect and reduce threat in multimedia networks, and developing a visual basic model to detect and reduce threat in multimedia networks were all used to achieve the goal. The stability number of threats to time occurred at time 4 seconds through 10 seconds at number of threats 80 conventionally, 75.26 using fuzzy, 46.19 using ANN, and 39.37 using block chain Technology are the results obtained after completing all of these measures. With these findings, it is clear that using block chain Technology provides the best threat detection and reduction in a multimedia network, with a 50.34 percent threat reduction increase over the traditional approach.

1. Introduction

Information infrastructure security is critical to achieving in the private or public domain for national security objectives. These infrastructures allow federation of autonomous domains to collect, manage, and share information to organizations that can form large electronic enterprise (e-enterprise) and operate within themselves. (Joshi et al., 2018; Thuraisingham, 2017). Information exchanged across multiple domains can take many, including forms, audio text, and video photographs, making security and privacy management more difficult.

Integrating security policies for partnering organizations with a cohesive capability for information protection, and also using collaborative expertise for detection and reacting to any emerging threat, are two of the most pressing security challenges. Furthermore, the protection of personal information is a concern.

A slew data of and analysis tools mining developed have cyber that can defenders to use sensitive collect from data and public multimedia private, as applications well as identify trends and events that indicate possible infrastructure threats. Data mining and encryption are two thus major in design the multimedia of - scalable based for techniques management threat information &infrastructure. The block-chain technology will be used in this study to enhance security management in a multimedia environment.

2. Methodology

To characterize the Star Times Nigeria PLC

Table 1 characterized data for multimedia network under threat

TYPES OF THREATS	% OF THREATS IN MULTIMEDIA NETWORK	TIME OF THREAT	DATE OF THREAT	DAYS OF THREAT
COPY RIGHT	80%	1PM	6/11/2018	1
HACKING IN TO ONES DATA OR DATA LEAKAGE	82%	2AM	7/8/2019	2
EXPLOTATION OF INTERNATE CONECTION	70%	3PM	8/6/2019	3
CORRUPTION OF DATA	60%	1AM	4/4/2019	4
BONNETS	60%	7AM	5/10/2018	5
Distributed denial-of-service (DDoS)	75%	4PM	6/6/2018	6
Malware	83%	2AM	7/10/2019	7
Pharming.	72%	5AM	1/4/2019	8
Phishing	78%	3AM	7/8/2018	9
Ransomware.	75%	12NOON	6/8/2019	10
Spam.	65%	3PM	8/11/2019	11
THEFT OF INTELLECTUAL PROPERTY	80%	1AM	17/10/2019	12
IDENTITY THEFT	73%	2AM	4/11/2018	13

THEFT OF EQUIPMENT OR INFORMATION	80%	2AM	1/2/2019	14
SABOTAGE	76%	3PM	4/7/2018	15
INFORMATION EXORTATION	75%	4.30AM	3/5/2019	16
SOLFTWARE ATTACK	67%	12MIDNIGHT	6/7/2019	17

This empirical data was used to create a mathematical model for using block chain Technology to improve security management in a multimedia environment. Using block chain Technology, a mathematical model for improving security management in a multimedia environment emerges.

$$\text{Maximize } T = x + 6y + 11z \qquad\qquad 1$$

Subject to

$$X + 6Y + 11z \leq 80 \qquad\qquad 2$$

$$2x + 7y + 8z \leq 82 \qquad\qquad 3$$

$$3x + 8y + 6z \leq 70 \qquad\qquad 4$$

Where

X is the time for threat in multimedia network.

Y is the date for the threat in multimedia network.

Z is the month of the threat in multimedia network.

T is the total number of threats in the multimedia network.

Then, the MATLAB optimization code for the mathematical model for improving security management in a multimedia environment using the block\chain Technology is shown in code 2.

Code 2: Optimization Code for the Mathematical Model for Improving Security Management

```
% IMPROVING SECURITY MANAGEMENT IN A MULTIMEDIA ENVIRONMENT USING THE BLOCK\CHAIN TECHNOLOGY

% Maximize T= x + 6y +11z

%     Subject to

%X + 6Y + 11z ? 80

% 2x + 7y + 8z ?82

%3x + 8y + 6z? 70

% Where

%X is the time for threat in multimedia network

%Y is the date for the threat in multimedia network.

%Z is the month of the threat in multimedia network.

%T is the total number of threats in the multimedia network.

    f=[-1 -6 -11];
```

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```
A=[1 6 11 ;2 7 8;3 8 6];

b=[80;82;70];
```

Aeq=[0 0 0];

beq=[0];

```
LB=[0 0 0];

UB=[infinfinf];

[X,FVAL,EXITFLAG]=linprog(f,A,b,Aeq,beq,LB,UB)
```

Code 2 shows optimization MATLAB code for security management in a multimedia environment using the block chain Technology. The result obtained is shown in code 2**.**

Code 2: Optimization Result for Security Management in a Multimedia Environment Using the Block Chain Technology

% IMPROVING SECURITY MANAGEMENT IN A MULTIMEDIA ENVIRONMENT USING THE BLOCK CHAIN TECHNOLOGY

% Maximize T= x + 6y +11z

%   Subject to

%X + 6Y + 11z ? 80

% 2x + 7y + 8z ?82

%3x + 8y + 6z? 70

%Where

%X is the time for threat in multimedia network

%Y is the date for the threat in multimedia network.

%Z is the month of the threat in multimedia network.

%T is the total number of threats in the multimedia network.

```
f=[-1 -6 -11];

A=[1 6 11 ;2 7 8;3 8 6];

b=[80;82;70];
```

Aeq=[0 0 0];

beq=[0];

```
LB=[0 0 0];

UB=[infinfinf];

[X,FVAL,EXITFLAG]=linprog(f,A,b,Aeq,beq,LB,UB)
```

Optimization terminated.

X =

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5.6585

0.0132

6.7511

FVAL =

 -80.0000

EXITFLAG =

  1

Code 2 shows Optimization result for security management in a multimedia environment using the block\chain Technology. Result obtained from the mathematical model shows that the total number of threat observed in multimedia network is 80%

To establish if there is a threat in the characterized network

Table 2 Summary of several test to establish security threats

NO OF SUBSCRIBERS TIME OF THE DAY	6 - 6.30P.M	6.30 - 7PM	7- 7.30PM	7.30- 8PM	8- 8.30PM	8.30 - 9PM	9- 9.30PM	9.30 - 10PM	10- 10.30 PM	10.30 – 11PM	11- 11.30 PM	11.30 – 12PM
350	-67dBm	-67dBm	-60dBm	-62dBm	-63dBm	-50dBm	-45dBm	-47dBm	-67dBm	-70dBm	-77dBm	-80dBm
400	-68dBm	-67dBm	-62dBm	-61dBm	-63dBm	-49dBm	-62dBm	-46dBm	-49dBm	-72dBm	-73dBm	-82dBm
450	-69dBm	-66dBm	-61dBm	-62dBm	-64dBm	-50dBm	-47dBm	-49dBm	-62dBm	-73dBm	-76dBm	-81dBm
500	-66dBm	-68dBm	-60dBm	-61dBm	-62dBm	-51dBm	-46dBm	-48dBm	-66dBm	-72dBm	-79dBm	-83dBm
550	-62dBm	-65dBm	-60dBm	-59dBm	-60dBm	-60dBm	-51dBm	-51dBm	-59dBm	-70dBm	-78dBm	-82dBm
600	-68dBm	-69dBm	-62dBm	-65dBm	-64dBm	-58dBm	-50dBm	-42dBm	-52dBm	-72dBm	-76dBm	-82dBm
650	-67dBm	-69dBm	-62dBm	-66dBm	-61dBm	-62dBm	-65dBm	-45dBm	-52dBm	-72dBm	-79dBm	-83dBm
700	-65dBm	-68dBm	-62dBm	-61dBm	-64dBm	-65dBm	-52dBm	-46dBm	-53dBm	-73dBm	-79dBm	-83dBm
750	-66dBm	-67dBm	-63dBm	-60dBm	-61dBm	-63dBm	-61dBm	-47dBm	-52dBm	-70dBm	-78dBm	-81dBm
800	-62dBm	-66dBm	-59dBm	-61dBm	-57dBm	-52dBm	-53dBm	-58dBm	-60dBm	-72dBm	-76dBm	-82dBm

Table 2 shows an empirical data collected from star time to show that there is an established problem in the network. From the data, it shows that there is fluctuation in the network at every row of the subscribers. That is to say, the network is not stable. With the empirical data obtained, it shows that the amplitude that should have been stable fluctuates along the line thereby causing interference in the network.
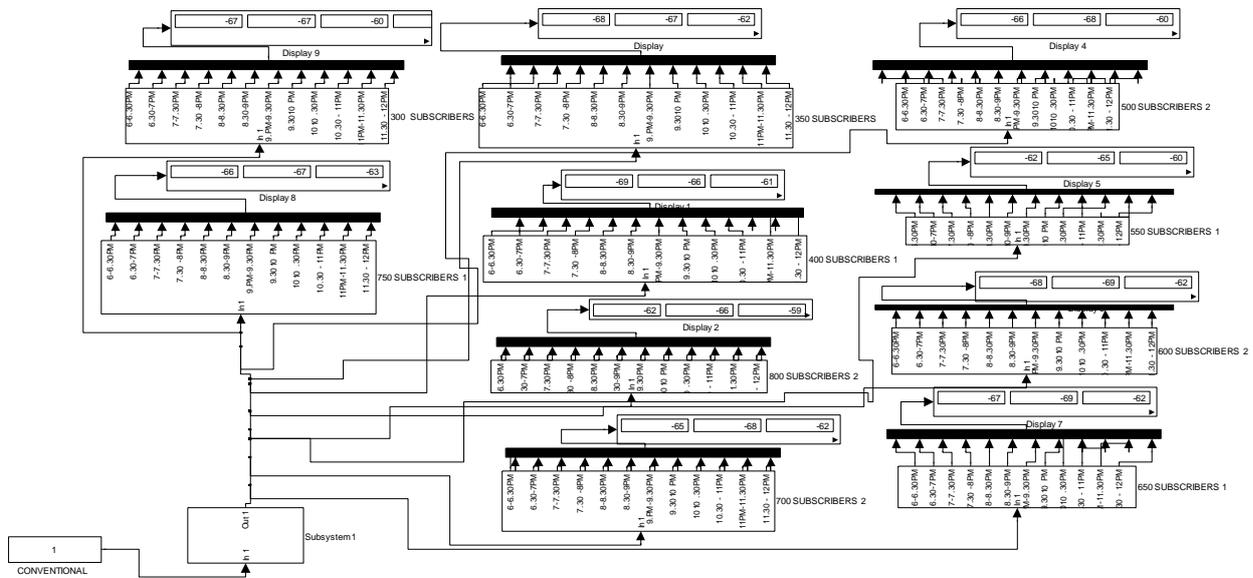

Fig 1 designed conventional model for established problem in the network

Fig 1 shows designed conventional model for established problem in the network. The collected empirical data of the problem in the network is incorporated in the model and simulated.

To design a block chain rule base that will detect and block the established threat

Figure 2 depicts a block chain rule base that will detect and block the established threat. The optimization result, along with the empirical data gathered, was used to create these rules in MATLAB software.

There are three laws in all, and they are as follows:

1. If threat is observed by sensor in multimedia network reduce then result is bad.
2. If threat is not observed by sensor in multimedia network maintains then result is good.
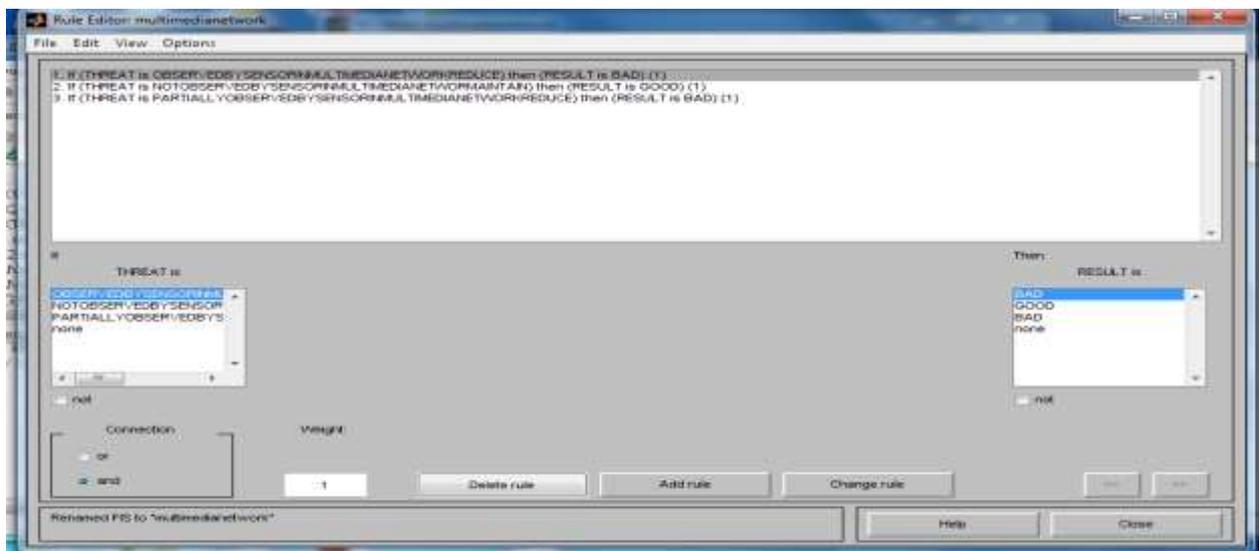3. If threat is partially observed by sensors in multimedia network reduce then result is bad.

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Fig 2 designed   block chain rule base that will detect and block the established threat

To train ANN in the block chain rule base to enhance the efficacy of detecting and blocking the threats.
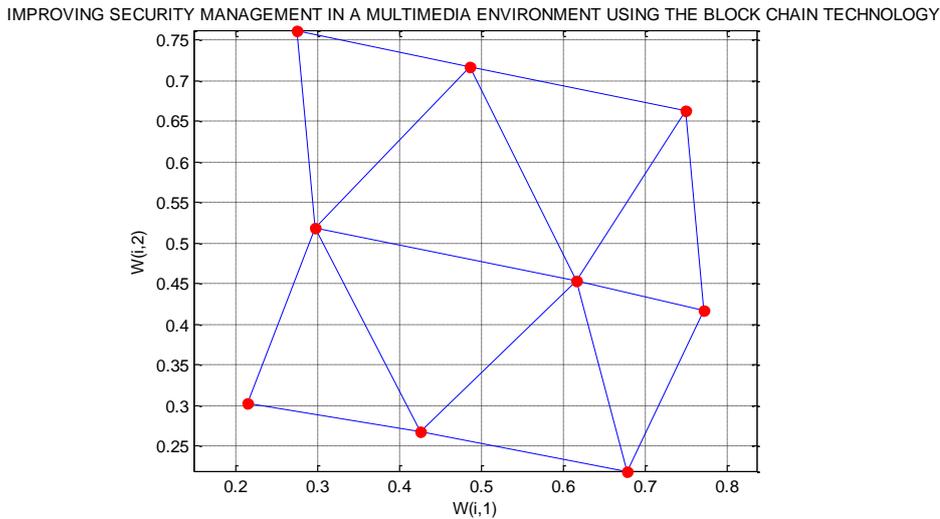

Figure 3 depicts the third training of an artificial neural network (ANN) in a block\chain Technology rule base for successful threat detection and reduction in a multimedia network. Figures 3 and 4 depict the obtained findings. Meanwhile, the findings show that training ANN three times in block\chain Technology yields the best results in terms of reducing threat in multimedia networks as compared to the first and second training
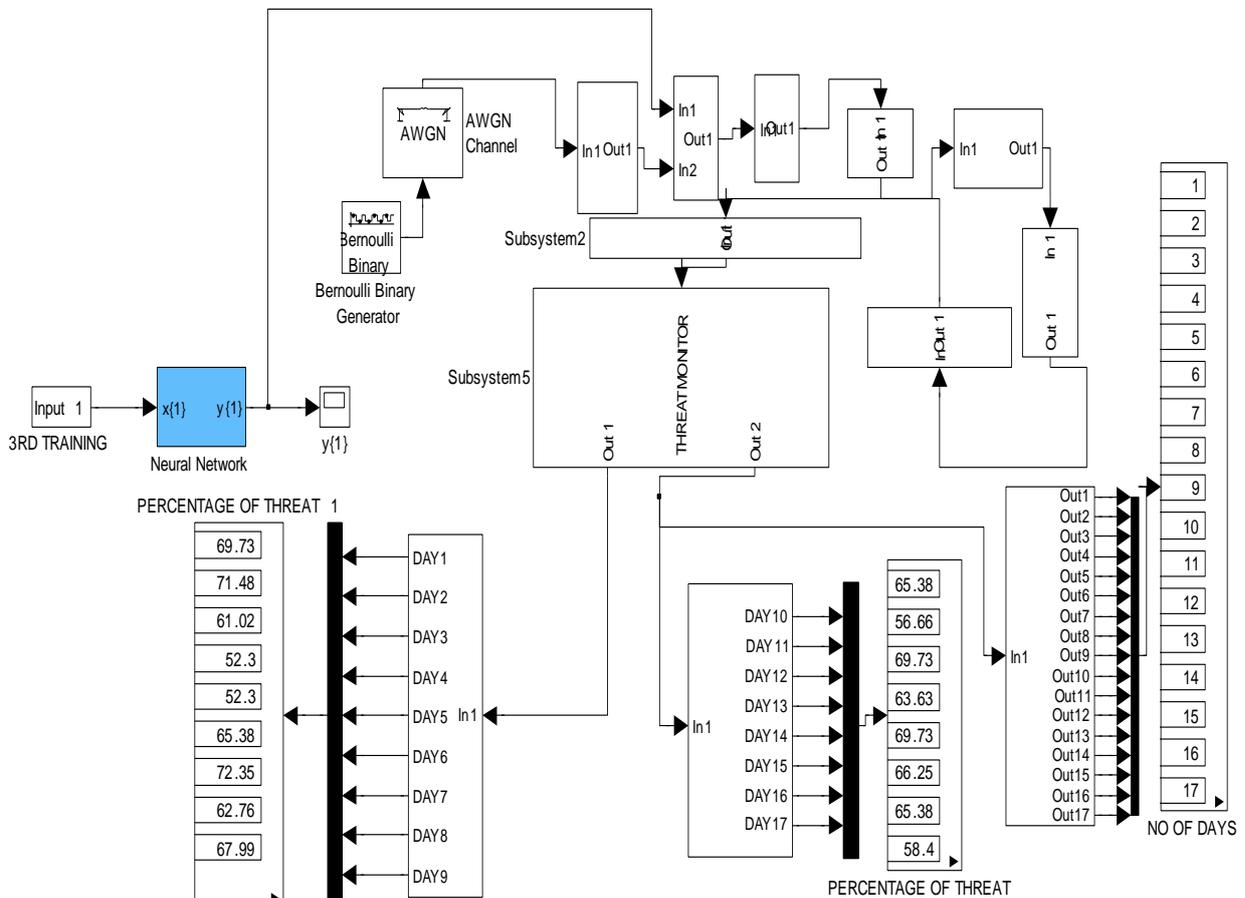

Fig 4 trained ANN in the block chain rule base to enhance the efficacy of detecting and blocking the threats.

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To develop a block chain algorithm that will effectively implement 3 and 4.

1. Identify the established threats in multimedia network.

2. Apply Established block\chain Technology rule base for detecting and reducing threats in multimedia networks.

3. Apply Trained Artificial Neural Network (ANN) in the Block\Chain Technology Rule Base for Effective Threat Detection and Reduction in a Multimedia Network.

4. Apply integration of 2 and 3 in 1

5. Is there threat in multimedia network when 4 is applied?

6. Yes go to 2 through 4

7. No go to 9

8. Improved security management in a multimedia environment

9. Stop

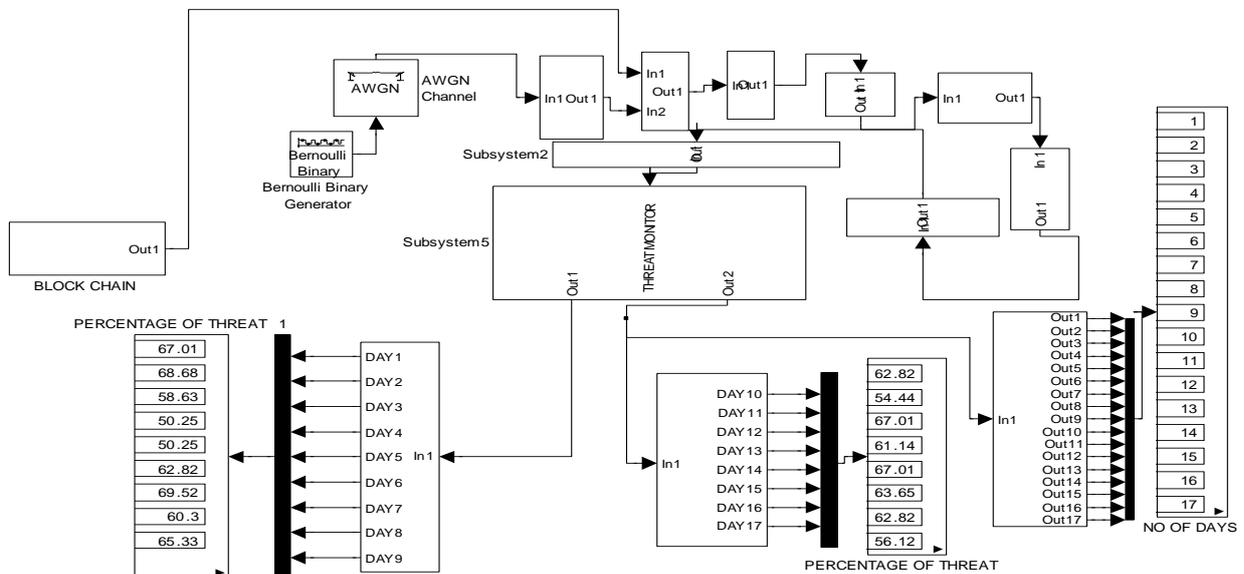To develop a SIMULINK model with block chain technology for network protection

Fig 5 developed a SIMULINK model with block chain technology for network protection. The results obtained are shown in figures 6 and 7

3.0 Discussion of Result
Table 3 comparing percentage of threat in multimedia network conventional, fuzzy, ANN and block chain technology

Subscribers	CONVENTIONAL % OF THREAT IN MULTIMEDIA NETWORK	FUZZY % OF THREAT IN MULTIMEDIA NETWORK	ANN % OF THREAT IN MULTIMEDIA NETWORK	BLOCKCHAIN % OF THREAT IN MULTIMEDIA NETWORK
350	80	78.79	69.73	67
400	82	80.76	71.48	68.68
450	70	68.94	61.62	58.63
500	60	59.09	52.3	50.25
550	60	59.09	52.3	50.25

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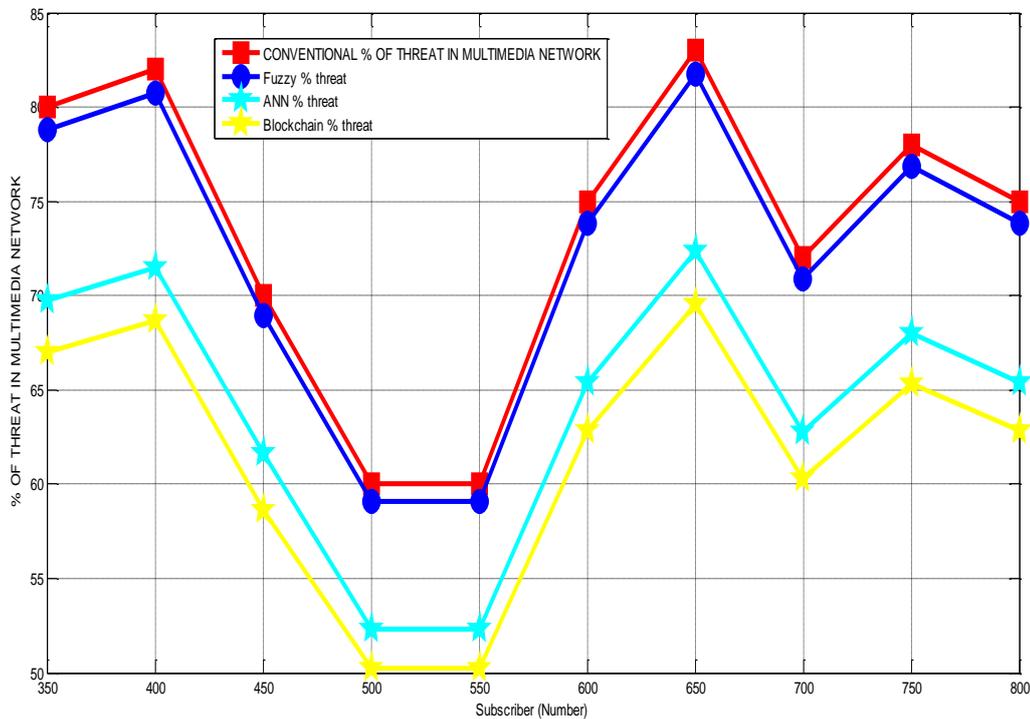| 600 | 75 | 73.86 | 65.38 | 62.82 |
650	83	81.74	72.35	69.52
700	72	70.91	62.76	60.3
750	78	76.82	67.99	65.33
800	75	73.86	65.38	62.82

Fig 6 comparing percentage of threat in multimedia network conventional, fuzzy, ANN and block chain technology.

Fig 6 shows comparing percentage of threat in multimedia network conventionally, fuzzy, ANN and block chain technology. At subscriber 700, the percentage of threat observed conventionally, using fuzzy, ANN and block chain are 75%, 73.86%, 65.38% and 62.82% respectively. With these results, it shows that using block chain technology gives the best threat reduction among the other three.

Table 4 Comparing number of threat in multimedia network conventional, fuzzy, ANN and block chain technology

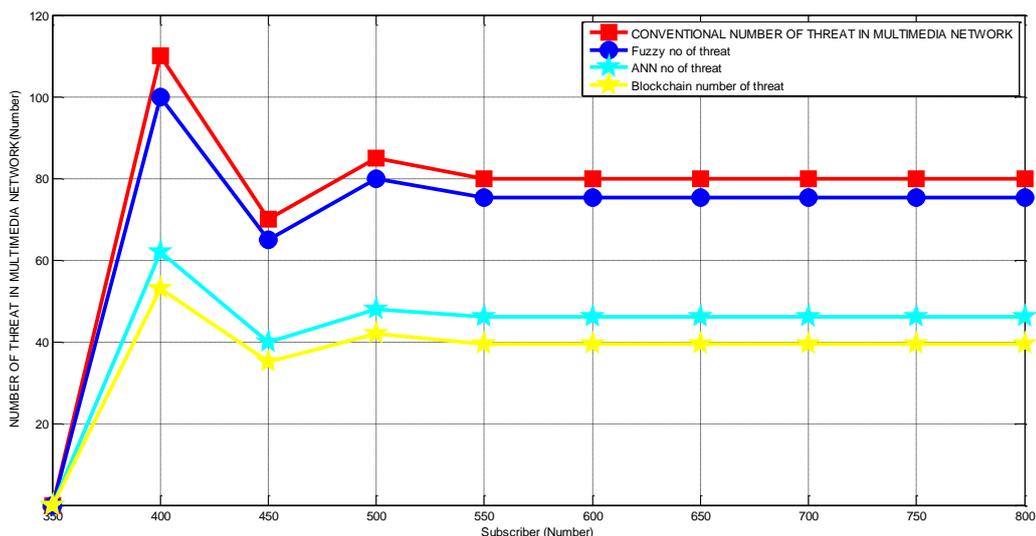| Subscriber	CONVENTIONAL NUMBER OF THREAT IN MULTIMEDIA NETWORK	FUZZY NUMBER OF THREAT IN MULTIMEDIA NETWORK	ANN NUMBER OF THREAT IN MULTIMEDIA NETWORK	BLOCKCHAIN NUMBER OF THREAT IN MULTIMEDIA NETWORK
350	0	0	0	0
400	110	100	62	53
450	70	65	40	35
500	85	80	48	42
550	80	75.26	46.19	39.37
600	80	75.26	46.19	39.37
650	80	75.26	46.19	39.37
700	80	75.26	46.19	39.37
750	80	75.26	46.19	39.37
800	80	75.26	46.19	39.37

Fig 7 comparing number of threat in multimedia network conventional, fuzzy, ANN and block chain technology

Fig 7 shows comparing number of threat in multimedia network conventional, fuzzy, ANN and block chain technology. The stability number of threats to subscribers occurred at subscriber 550 through subscriber 800 at number of threats 80 conventionally, 75.26 using fuzzy, 46.19 using ANN and 39.37 using block chain technology. With these results, it shows that using block chain gives the best threat reduction among others.

4.0 Conclusion
The global spate for copy right violation and authentication is assuming a frightening dimension. This has affected the financial fortune of not only the network providers but also publishers and authors as their original contents are being violated. But with block chain technology incorporating intelligent the performance of the network against violation is enhanced

Reference

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Thuraisingham, B. (2016). Management and mining multimedia databases. *International Journal of Tools in Artificial Intelligence*, 13, 730–749