

Analysis of time delays incurred for security in cloud based data services for educare systems

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Abstract: In the recent times, when the pandemic has hit the civilization hard, education system has also taken a huge set back. This has led to the advent of online platforms for education using cloud technology to a great extent. Most platforms utilize cloud based transmission of data with artificial intelligence to aid the learning curve of the students. Each system has its own advantages and disadvantages as seen and reinforced by the media. However, the issue that is not addressed in detail is the security for the user data. In this paper we present an analysis of the time delay in securing the data while proposing that data security has to be an integral part of cloud based streaming services for education at any level.

Keywords: Artificial Intelligence, Cloud platform, Data security, online education.

I. INTRODUCTION:

In recent years cloud based data storage and analysis systems have seen a brilliant rise into being the lynchpin of IT enabled services (ITES). And the recent pandemic has created a huge surge in the research and development of online platforms of education at all levels. Some of them are reviewed in the next part of this paper. The development has become so rapid that, many a considerations for privacy and security have been ignored in the race towards usability and experience. However, as it has been shown in the analysis presented in this work, security and privacy of data cannot take a back seat in the platform development and they have to be given their due importance. Some works reviewed in this work have also stated clearly the priority that has to be given to data security and user privacy. This work analyses the time taken to secure data over user datagram packets (UDP) a service used in data streaming services [1] over cloud based education platforms [2] and presents the results.

II. REVIEW OF LITERATURE

This research work encompasses the study of cloud computing, cloud platforms for education, network security, cloud security and their performance issues and features. The study done so far is presented below.

Rabi Prasad Padhy et al.[3] describe outlines of what cloud computing is, the various cloud models and the main security risks and issues that are currently present within the cloud computing industry. Their paper also analyzes the key research and challenges that are present in cloud computing and offers some of the best practices regarding features, pricing and other services to service providers as well as enterprises.

[4] This paper examines the use of social learning platforms in conjunction with the emergent pedagogy of the “flipped classroom”;. In particular the attributes of the social learning platform “Edmodo” is considered alongside the changes in the way in which online learning environments are being implemented, especially within British education. Some observations are made regarding the use and usefulness of these platforms along with a consideration of the increasingly decentralized nature of education in the United Kingdom.

[5] This paper presents a review on the cloud computing concepts as well as security issues inherent within the context of cloud computing and cloud infrastructure. In some cases, it might be required or at least possible for a person to store data on remote cloud servers.

All the above three states of cloud computing are severely prone to security breach that makes the research and investigation within the security aspects of cloud computing practice an imperative one. There have been a number of different blends that are being used in cloud computing realm, but the core concept remain same – the infrastructure, or roughly speaking, the resources remain somewhere else with someone else's ownership and the users rent; it for the time they use the infrastructure.

[6] This white paper surveying the transformation of classic IT operations also reveals some of the questions that, unanswered, can impede the journey from static, tightly coupled technology “stacks” to the cloud. How do IT strategists and decision-makers balance the promises of cloud computing, be it on the public or private horizon, and the security needed to safeguard information assets and ensure regulatory compliance? While the increased agility that comes with moving to the cloud solves many current technology challenges, the journey to cloud computing also accelerates the erosion of perimeter enforcement and trust boundaries.

[7] This white paper presents that Cloud computing is an incredible innovation. While at its heart a simple concept, the packaging of compute resources as an on demand service is having a fundamental impact on information technology with far reaching consequences. As governments, businesses and consumers move to adopt cloud computing en masse, the stakes could not be higher to gain assurance that cloud is a safe, secure, transparent, and trusted platform. This paper seeks to view the cloud computing industry through the lens of the enterprise information security practitioner. By articulating the state of cloud security from this viewpoint, we can better understand the gaps and solutions we must advocate for and help cloud providers better understand the needs of their consumers.

[8] This paper proposes a PC based Interactive Video platform for e-learning and remote services. Recently, multimedia technology has been greatly progressed on content bandwidth and picture quality. Problems used to be solved by face to face meetings, now it may be solved over an Internet video meeting in no time delay. Nowadays, people who need help may use a NB or a smart phone to receive all kinds of help or solutions from all over the world. As the gradually mature of cloud computing technology, the generated large amount of audio and video contents by the aforementioned Internet video meetings, can be readily transformed and saved in a searchable video database, such that the proposed platform can provide further more complete, friendly and useful distance services.

[9] This research work illustrates that with the huge technological progress, Technology fever has invaded all social and economic fields and one of these fields is the educational one. The e-learning systems which are based on the principle of the online courses, these systems are the most important aspects of the involvement of technology in education. However, when one talks about any computer system using any kind of networks we are supposed to treat the security issue of this system. Although the security issue is important, it hadn't got much attention in the development of an e-learning platform. The authors expose some vulnerability that can be found in the connecting bridge between the profiles of learners and other resources in the e-learning platform.

[10] This white paper explores the areas of Telework, remote work, mobile workers, telecommuting, distributed work, and other similar alternatives to traditional, central-office based employees represent fast-growing trends for many—if not most—organizations of all sizes. How best to encourage, motivate, measure, support, and integrate these employees constitute some of the primary challenges facing managers in the new millennium. Although the inexorable move from “one-worker, one-place” to much more flexible, adaptable definitions for corporate work strategies began in the '80s and accelerated in the '90s, several more recent events combined with certain economic realities have forced even cautious, conservative organizations to begin developing and adopting strategic remote-worker policies in the new century.

[11] This white paper addresses a pivotal issue in the exploding cloud service namely, Enterprises face a number of considerations and trade-offs when shopping for a cloud vendor, including performance, price, and feature sets. Still, while security “is not the only criterion someone should look at, it is really critical.” “If an organization has a mission-critical application and it considers that as a big advantage to putting it into the cloud, but it contains some kind of trade secret or something that is absolutely critical to the way the company is run, then security is the top priority,” Once decision makers determine which cloud environment and model they want to use for their enterprise, they should approach vendors seeking specific information about security-related issues.

III. PROPOSED METHOD

The proposed algorithm is as follows

Steps

1. Generate data packets over a cloud simulated on a network using various sizes
2. Transmit them over UDP
3. Compute time for transit
4. Store time into an array
5. Add a simple encryption and authentication on top of the UDP
6. Transmit same sized packets to same nodes from 1 and 2
7. Compute the time for transit
8. Store time into a second array
9. Verify time delay for the rendition in both 4 and 8
10. Check time trend

Here the simulation is done on CloudSim a free cloud simulator tool on Linux operating system. The packets are streamed using UDP to mimic the behavior of cloud based streaming services. Generally however, streaming services use Transmission Control Protocol (TCP) [2] for guaranteed services. But as both TCP and UDP rely on Internet Protocol (IP) for packet transmission, most education platforms utilize UDP.

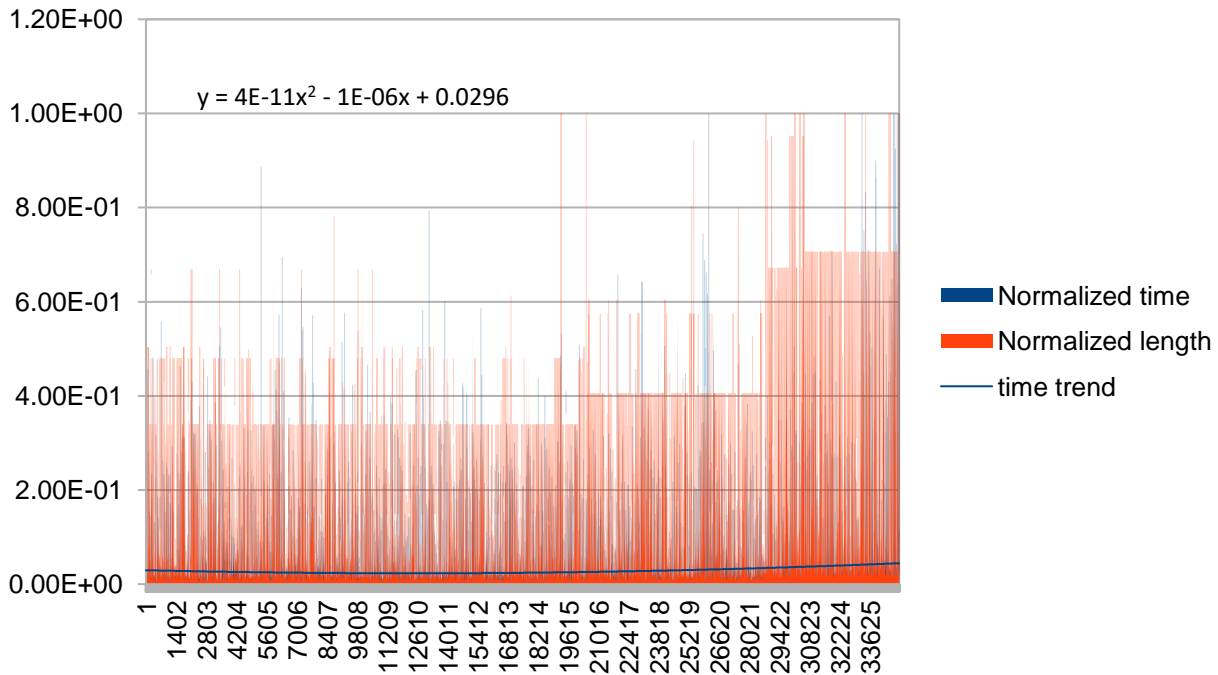
IV. EXPERIMENT AND DISCUSSION

The algorithm was run over 34000 packets of various sizes. The times were captured and due to the major variance observed, the size and time variables are normalized. Then they are plotted in a stacked format to observe the trend. The same can be seen in Figure 1. The data used for the plot is shown in Table 1.

Table 1. The difference in time (Delta time) and length variables in their true and normalized values –sample

Delta Time	Length	Normalized time	Normalized length
6.20E-05	42	2.04E-03	4.80E-03
0	66	0.00E+00	7.54E-03
0.000537	174	1.77E-02	1.99E-02
0.000414	102	1.37E-02	1.17E-02
0.000255	66	8.41E-03	7.54E-03
0.000341	174	1.12E-02	1.99E-02
0.000445	102	1.47E-02	1.17E-02
0.000249	66	8.21E-03	7.54E-03
0.000433	158	1.43E-02	1.80E-02
0.000522	102	1.72E-02	1.17E-02
0.000236	66	7.78E-03	7.54E-03
0.000543	102	1.79E-02	1.17E-02
0.000895	174	2.95E-02	1.99E-02
0.000413	102	1.36E-02	1.17E-02
0.000426	174	1.40E-02	1.99E-02
0.000326	102	1.07E-02	1.17E-02
0.000445	174	1.47E-02	1.99E-02
0.003292	66	1.09E-01	7.54E-03
0.000699	1654	2.30E-02	1.89E-01
0.000491	102	1.62E-02	1.17E-02
0.000416	174	1.37E-02	1.99E-02
0.001149	102	3.79E-02	1.17E-02

The experiment was conducted on a desktop machine acting as a receiver node with 4 GB of Random Access Memory (RAM) with a Linux operating system and a Rack server with 16 GB of RAM with Linux server OS over a backbone connection of 100 Mbps data rate and the simulation was done on a simulated cloud with CloudSim (A free cloud simulator). The graph shows that even for largely varying data packet sizes, the time for securing the data was not increased in proportion to the size.



V. CONCLUSION

To conclude, we state from the analysis of the graph that, the expression shown in the graph, for the trend line followed by the time difference, delta time shows clearly that securing the data is not taxing on the time consumption by the software as claimed by several platforms. Hence security of data and user privacy can be considered as integral parts of such systems rather than being provided as add ons.

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