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A Cloud Security with Performance Increase and Energy Efficient using AI with DCS and PDC

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Abstract

Now a day, the contents construction is changed dynamically according to a user's request, and has been widespreading across the sensor nodes. This paper proposes a technique to fast response to the dynamic content of various sensor nodes by the help of cache segmentation between server and the user, and describes the design of our proposed network cache system and provides security to Cluster nodes in Cloud in cloud by using Artificial Intelligence (AI) as a barrier where every data files goes inside cluster, it gets scanned by AI for viruses and makes data virus-free. The paper contains a new concept where Cluster of sensor nodes in cloud are energy efficient by last level cache (LLC), secured by AI, and performance is increased by using dynamic cache segmentation (DCS). It explains how AI actually safeguards Cluster of sensor nodes. Though AI is used for many purposes such as Gaming, Robotics etc., it is not yet used for Cluster of sensor nodes. In detail, the paper presents the functioning of AI as a protective layer, last level cache for low energy consumption and performance increase by dynamic cache segmentation. It mainly focuses on Data Security and Performance Increase with Energy Efficiency of the Cluster nodes in Cloud.

***Key Words*:** Artificial Intelligence (AI), last level cache (LLC), dynamic cache segmentation (DCS), Power Down Cache(PDC), Cluster node, Data Security, Performance Increase and Energy Efficienct.

1 Introduction

Modern computing devices include multiple CPU cores and large DRAMs for high performance. They are typically backed by batteries, and thus low energy consumption is considered as the first class citizen to prolong their life- times after battery charging. Multicore CPUs consume more energy than single-core CPUs because of more cores and larger cache memories. Various schemes are proposed to reduce their energy consumptions at various levels. Last-level caches (LLCs) play important roles of improving performance and reducing energy consumption by filtering out costly accesses to the memory system. The size of LLC is getting larger to support multicore systems better, which run many programs simultaneously. Thus, the LLC consumes more energy when many cores are involved. A large LLC that exceeds program demand capacity generally increases energy consumption without improving performance. Because programs demand different LLC capacities and SRAM LLCs consume large leakage energy, several techniques have been proposed to reduce leakage energy consumption of LLCs. An effective and natural solution is to selectively power down some LLC ways when LLC capacity exceeds a needed capacity by programs, which eliminates leakage energy consumption in these powered down LLC ways [2]. However, the reduced associativity of way-powered-down LLC decreases performance due to increased LLC conflict misses, which may result in actual increase in energy consumption. In this paper, we propose a way-filtering (WF)-based logicalassociative LLC architecture to reduce the energy consumption of LLCs. This architecture logically increases the associativity of LLCs when one to three cache ways are activated, and thus improves performance and reduces energy consumption. To further decrease tag way energy consumption, we utilize a partial tag-based WF scheme. In addition, a sequential logical way accessing and indexing scheme is proposed to support multiple LLC logical way accesses when multiple logical way hits occur in one physical way using the partial tag-based way filter. To make our proposed WF-based logicalassociative LLC architecture to be practical, we propose a dynamic resizing algorithm to eliminate the need for static cache profiling to determine an energy-optimized LLC configuration. Energy-optimized configuration means the configuration that consumes the least energy. Starting from one LLC data way, our dynamic resizing algorithm activates more or fewer LLC data ways using the approximate standard deviation of cache misses of LLC logical sets as a metric for measuring cache way demand. A logical set is a set of cache lines that use the same index in logical ways. A logical way is an internal cache way that is divided from a cache way.

CLARIN with DCS is Cluster nodes in Cloud in cloud using Artificial Intelligence with Dynamic Cache Segmentation, software which provides AI (artificial intelligence) Security to Cluster nodes in Cloud along with Increasing in the dynamic content responsiveness of sensor nodes and life time as well. According to CSA (Cloud Security Alliance) there are 9 Security problems that CLOUD is facing, which is often called as Notorious nine. Those are: Data Breaches, Data Loss, Account Hijacking, Insecure AIPs, Denial of service, Malicious Insiders, Abuse and Nefarious use, Insufficient due diligence, Shared Technology Issue.

Along with above some of the Challenges of Cloud are:- Energy Efficiency, Responsiveness, Robustness, Self-Configuration and Adaptation, Scalability, Heterogeneity, Systematic Design, Privacy and Security.

By introducing CLARIN with DCS we are solving several issues like, Data Breaches, Data Loss, Account Hijacking, Shared technology Issue, Malicious Insiders, abuse and nefarious use, Energy Efficiency, Responsiveness. Dynamic content is referred to as web pages whose construction, such as displayed images and processing results is varied in response to users requests. It is generated at the origin web servers located in the service providers and is then transferred to the users. Static content, whose construction is fixed, can be cached at cache servers located near users and be served locally when the same request comes from other users. The pre-fetching is effective in terms of the responsiveness; there is no benefit of caching due to little reuse probability. On the other hand, the one generated based on queries in users requests which may be identical among multiple users, and caching such dynamic content is promising to give improved performance of web services. The CLOUD delivers a hosting environment that is immediate, flexible, scalable and available while saving corporations money, time and resources. It provides on-demand access to virtualized IT resources that can share by others. From past few years, Cloud is not as secure and safe as it was earlier. But now, cyber criminals hack data of Cloud in an easier way, they transfer malicious virus into the cloud. This results in data loss. They gain access to every files and documents which are confidential. They put down websites. to avoid the above said problem the proposed system uses AI, where it blocks the hackers and virus introducers into the system by sending back the virus to the introducers.

2 RELATED WORK

Many circuit-level techniques for reducing the leakage energy of the cache memory have been proposed. The gated-Vdd proposed by Powell et al. [12] is used in many cache designs [6], but it incurs data loss. The drowsy cache scheme [10] is proposed to reduce leakage energy in unused individual cache lines without data loss. The DRG-cache scheme [11] is proposed to reduce leakage energy of a cache memory without data loss. Its hardware complexity is lower than that of the drowsy cache, but its energy reduction is smaller. However, it is difficult for these two techniques to be applied to real circuits due to process variations, which can make low-voltage SRAM cells faulty [5].

Many architectural studies have been conducted to reduce the leakage energy of the cache memory. The most well-known technique is the selective cache ways [2], which was developed to decrease dynamic energy but is also effective in reducing leakage energy. This technique selectively disables a subset of cache ways to reduce cache energy, This approach is quite effective because many programs do not require an entire cache capacity [1]. This fact has been exploited by many studies to reduce energy consumption or to increase performance. Many researchers tried to reduce the number of ways with little performance degradation. Determining how many cache ways are required is very important. A dynamic cache resizing technique for multicore systems has recently been proposed [4]. Qureshi and Patt used utility monitors to compute an appropriate cache size when cache resizing is performed. We implement the proposed cache size estimation scheme to compare it with our proposed cache architecture.

There have been several approaches at either edge of a network. However, a user must communicate with servers inside a service provider to get the content. Thus, the expected performance gain is limited because it can just shorten the time to generate dynamic content at origin servers inside the service provider.

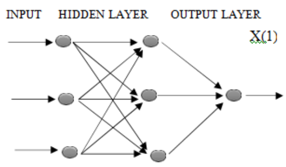
Cloud Network is the most developing field. Though we have many uses through Clusters which are not secure and more delay in data transfer. Some of the CLOUD applications are:- Habitat and Ecosystem Monitoring, Seismic Monitoring, Civil Structural Health Monitoring, Monitoring Groundwater Contamination, Rapid Emergency Response , Industrial Process Monitoring , Perimeter Security and Surveillance and Automated Building Climate Control.

Since many kinds of dynamic content are served from the origin servers, it is more difficult in general to improve a responsiveness of dynamic content than static one that can be cached at a location close to users.

3 WORKING of AI, PDC and DCS

3.1 How AI WORKS?

As security is most demanding in CLOUD now, we are concentrating on cluster. Cluster data storing is the biggest and emerging trend in the market now. Large data can be stored in cluster. Nowadays everything gets uploaded to server. So we are providing AI security to Cluster. But not only for cluster, can one provide AI security to other fields. AI provides the security in two levels and checks for the bugs and virus for every given period of time. Neural networks are made up of simple components functioning in parallel. These components are stimulated through biological nervous systems. As per in their nature, the connections amongst numerous components mostly define the specific network function. An individual could easily train a NN to accomplish a particular function by means of amending the values of the weights (connections) amongst several components. Normally, neural networks are trained, or adjusted, so, particularly, input directs to a precise target output. The subsequent figure demonstrates such circumstance. At this point, the network is agreed, dependent on a comparison of the O/P in addition to the target, unless the network O/P matches the actual target. Typically, such types of input/target pairs are required to train a network. With this rule, as through other sorts of back propagation techniques, 'learning' is a supervised procedure which take place with every single cycle or 'epoch' which is demonstrated with a novel input pattern through a forward activation flow of O/Ps, in addition to the backwards error propagation of weight amendments.



Neural Network, principally, demonstrated with a specific scheme, this makes an arbitrary 'guess' as in the direction of what it might be. These networks have been trained in the direction of performing complex functions in numerous areas, which also encompasses speech, pattern recognition, vision, control systems, identification, and classification. Neural networks could also be trained towards resolving issues which are challenging for conventional computers or human beings. Even though, there are numerous different types of learning rules utilized via neural networks, this specific demonstration is concerned simply with one and only the delta rule. This specific delta rule is so often used by the utmost common class of Artificial Neural Networks entitled as feed forward neural networks. The training criteria of NN can be summarized below:

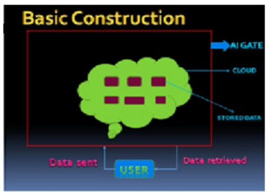
i. Input is given to input neurons

ii. Obtained output response is compared to input data.

iii. Error data is utilised to manage the weights attached to neurons.

iv. Hidden units find outs its error during back signal.

v. Then weights gets updated in the end.



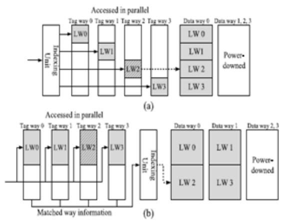
Basic constuction of Cloud without AI

3.2 HOW PDC in LLC WORKS?

Last-level caches (LLCs) help improve performance but suffer from energy overhead because of their large sizes. An effective solution to this problem is to selectively power down several cache ways, which, however, reduces cache associativity and performance and thus limits its effectiveness in reducing energy consumption. A sequentialassociative cache architecture is proposed for direct-mapped caches so that applying sequential association to direct-mapped LLCs is possible. However, this architecture suffers from the following problems. Typical LLCs adopt high associativity to minimize memory accesses [22], and thus, the sequential-associativity should be high. However, the conventional sequential cache association incurs performance loss in highly sequentialassociative direct-mapped LLCs due to low sequential way prediction accuracy and large penalty of wrong predictions. In addition, this architecture cannot support power down of each sequential cache way to reduce leakage energy consumption. Thus, we propose a new cache architecture that can be applied to set-associative LLCs. To overcome this limitation, we propose a new cache architecture that can logically increase cache associativity of way-powered-down LLCs. We call this cache architecture logicalassociative cache.

Our proposed scheme is designed to be dynamic in activating an appropriate number of cache ways in order to eliminate the need for static profiling to determine an energy-optimized cache configuration.

Our first idea to design the logicalassociative cache architecture is to activate all tag ways to access them in parallel and not to activate all data ways to reduce their leakage energy consumption. Increasing cache associativity to support parallel access is a very effective solution to increase performance.



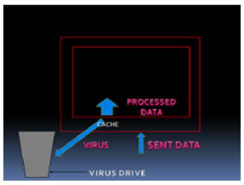
NF parallel logicalassociative cache for a four-way cache.

(a) and (b) All tag ways are accessed in parallel. The solid arrows indicate tag way accesses and the dotted arrows indicate data way accesses when a tag hit occurs. LW stands for logical way.

The proposed dynamic scheme reduces the energy consumption of LLCs compared with the best performing conventional static cache configuration. The overall system energy consumption including CPU, L2 cache, and DRAM is reduced on quad-core systems. A method of pre-fetching dynamic content on each client, i.e., a mobile terminal. By using this method, the response time could be shortened if the same user accesses the same content repeatedly. However, other users who want to get the same content still have to communicate with origin servers to get the data. Second, our dynamic resizing algorithm eliminates the need for static cache profiling, which makes our proposal better applicable to real systems than previous works.

3.3 HOW CLARIN WITH DCS WORKS?

CLARIN basically consists of a Cluster, AI Coat with a Gate. CLARIN provides a coat on Cluster which scans every data through AI. When the user sends the data through AI gate, it checks for any virus. If any virus is found it removes the virus and sends it to the virus drive.



CLARIN with DCS

Now the data gets stored in the cluster. Every given period of time AI scans for the virus, because there may be some in-built virus in the cluster and it removes then sends to the virus drive.

Cache is placed between the two gates of AI, so that it serves the data the user in a faster rate by means of perfecting method. In order to improve performance, a special cache system with dynamic content pre-fetching in between the two gates of AI. In-network Caching with Dynamic Content Perfecting As shown in above figure, we implemented in-network cache and pre-fetching system named "Pre-fetching Server" nearby users. To improve the responsiveness and reuse the same dynamic content by multiple users, this system provides the following functions.

1) Caching function: The server stores both static and some types of dynamic content which has been received from origin servers and directly serves users requests instead of forwarding the requests to the origin servers.

2) Pre-fetching function: The server, on behalf of users, fetches in advance dynamic content which users might want to get, later.

Data drive also plays a key role here. When any hacker tries to break in to the AI gate or try transferring any viruses. The AI tracks down the hackers location, and sends the viruses which are stored from the drive to their system.

Now, when the user of CLARIN wants to retrieve the data, it asks for a password. The one more key thing about the password is that, the password changes for every minute and when the user wants to retrieve the data, the latest password is entered, which is generated by OTP(One Time Password).When the data is retrieved, AI gate again checks for any viruses and checks for any data loss. If everything is fine, the data is retrieved by the user.

3.4 MAIN PURPOSE OF CLARIN WITH DCS

1. It serves as a main purpose of security of confidential data.

2. It can be used in defence to secure their information such as their nuclear missile activation code, their weapon construction, special forces people information.

3. CLARIN can be used in industries to secure their product information. In software companies to secure their programs, and in other field also.

4. As it can be used not only for cluster and for other field also, it can be used by everyone.

5. It speed up the data transfer by increasing the responsiveness of the dynamic content by using cache segmentation as in case of static content of the sensor nodes

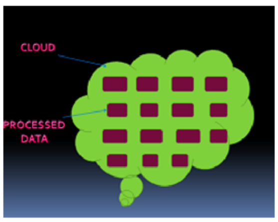
6. It avoids the data breach as it uses the technique of AI coat.

7. It provides the security against the virus by introducing the virus drive between the Cluster nodes in Cloud and the user.

3.5 SERVICES PROVIDED BY CLARIN

Basic user- In this level public will be provided our service where they can keep their data. In this the password can be changed by the user. The user can retrieve data by typing the given password.

Advanced user- In this we provide service to defence people where they can keep their high confidential data without a threat by cyber criminals. In this, the data will get automatically get scrambled once it goes through AI gate which can be only decrypted by typing a key that user has, which is secondary key. The primary key is used to only retrieve data. The retrieved data will be encrypted and it can be decrypted by giving secondary key. The primary password changes every day. Daily scanning is done for more security. The processed secured data in cloud by using AI and DCS is shown in the below figure.



The processed data in cloud by using AI and DCS

3.5.1 ADVANTAGES

1. CLARIN with DCS solves 6 security issues out of 9 security issue and some of the challenges of CLOUD.

2. The system never crashes . 3. Using Artificial Intelligence itself is a big advantage.

4. No need to think about system security as no person can hack AI.

4 CONCLUSION

CLOUD is widely evolving field where security is much more needed. Wireless sensor networks are different from traditional network in number of aspects, thereby, necessitating protocols and tools that address unique challenges and limitations. As a consequence, wireless sensor networks require innovative solutions for energy aware and real- time routing, security, scheduling, localization, node clustering, data aggregation, fault detection and data integrity. Through our proposed theory we are giving a new dimension for cluster security. Security of the cluster can be improved by trusted computing. CLARIN is like Chlorine, which cleans water by removing bacteria, similarly CLARIN which cleans cloud by removing viruses. CLARIN with DCS increases the performance of the cluster, faster access of data and increases the life time of the sensor nodes.

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