CLOUD FRAMEWORK: WEB BASED FOR AGRICULTURE DATA SHARING ACROSS AWS PLATFORM

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Abstract:

With more and more data moving to the cloud, privacy of user data have raised great concerns. Client-side encryption/decryption seems to be an attractive solution to protect data security, however, the existing solutions encountered three major challenges: low security due to encryption with low-entropy PIN, inconvenient data sharing with traditional encryption algorithms, and poor usability with dedicated software/plugins that require certain types of terminals. This work designs and implements Cloud Framework, a practical browser-side encryption solution, leveraging modern Web technologies. It solves all the above three problems while achieves several additional remarkable features: robust and immediate user revocation, fast data processing with offline encryption and outsourced decryption. Notably, our solution works on any device equipped with a Web user agent, including Web browsers, mobile and PC applications. We implement Cloud Framework based on own Cloud for basic file management utility, and utilize Web Assembly and Web Cryptography API for complex cryptographic operations integration. Finally, comprehensive experiments are conducted with many well-known browsers, Android and PC applications, which indicates that Cloud Framework is cross-platform and efficient.

1. Introduction:

For much of the history of computing data-generating resources have been consolidated in institutional data centers. End-users connect over communication networks to access central data and computational resources. With the emergence of so-called "Cloud Computing" many computational resources have moved out of institutional data centers, but the practice of direct end-user access to central data centers persists. However, with the police rise of smart devices such as phones, sensors, and other distributed instrumentation a great deal of data generation moved from data centers to the devices. In China alone there were a reported 9 billion devices as of 2014, with estimates of 24 billion by 2022. By the year 2022 there will be an estimated 50 billion network connected devices globally and 43 trillion gigabytes of electronic data [1].

CF is defined as the movement of goods from producer to consumer. It is a network that is made up of independent or semi-independent business entities such as producers, suppliers, retailers, and clients who are involved in the manufacturing and distribution of goods. It covers all from item improvement, sourcing, generation, coordination, and the data frameworks required to facilitate these exercises [2]. Since early times, cloud Frameworks have occurred, starting with the first item shaped or service formed and sold. But with industrialization and globalization, CF got to be more refined, permitting companies to do a more proficient work of creating and conveying

merchandise and administrations [3]. Organizations can now identify failure before it occurs and take proactive measures to prevent it. They make an exact estimate that supports meeting client requests and monetary goals simultaneously. Every node in the cloud Framework network must be concurred upon and flexible in response to the needs of the consumer and competent in dealing with issues such as tracking, exchange approaches, shipping modes, and so on. Consumers also have various options for purchasing products, including in store, online, and more, putting them in the driver's seat when it comes to defining CF priorities. Enhancing decision support for farmers is contingent on integrating data from various sources [4]. For instance, the combination of weather, topological terrain, irrigation, and crop yield data would contribute to irrigation management decisions, and the combination of beehive treatment information, data on plants growing around the beehive area, and honey production levels would improve beehive management decisions. Importantly, however, data integration alone is not sufficient for decision support – it should also be possible to conveniently analyze the data and infer valuable insights from them [5].

A framework for integrating and analyzing agricultural data from various sources, which leverages cloud-computing, thereby contributing to the scalability, flexibility, affordability, and maintainability of the solution compared to existing solutions. The framework defines a functional infrastructure of cloud-based services that facilitate integration, analysis, and data visualization. The framework services can be either end-user applications or services intended as a platform for creating new services. It should be noted that the framework is designed to integrate and process data from both existing external databases and new databases, while reusing exiting software services when possible. The framework is demonstrated and evaluated in several use cases. Each use case represents different data integration requirements and is based on different services of the proposed framework [6].

2. Literature Survey

2.1 Existing Problem

The IoT devices captures data and sends it to Cloud for computation but data transfer process from IoT device to Cloud can take lot of time if volume of data is large. Therefore, it makes sense to process captured data locally at IoT edge node to avoid latency. In Edge Computing, the Gateway stores data and perform computations along with traffic aggregation and routing. While Edge analytics allows pre-processing and filtering of the data closer to where it’s being created but the data which falls within normal range can be stored in low cost IoT storage and abnormal readings will be sent to Data Lake or in-memory database. Edge Computing will boost traditional Cloud computing model with service nodes placed at the network edges. It will help traditional data center cloud models by reducing latency and increased bandwidth. In future computation and data processing power will slowly shift towards edge devices like sensors, drones, driverless cars etc [7]. Playing augmented reality, 3D video games, and content-based video analysis is a challenge on mobile phone due to limited processing power and battery life. Real-time analysis of massive sensor data is needed in industries like manufacturing, mining, transportation to detect anomalies and send alerts. Therefore, Edge Computing and Cloud computing are likely to follow more of a hybrid approach and complement each other [8].

Survey 1:

TITLE: MULTI-AGENT BASED FRAMEWORK FOR AGRI CULTURE AND RELIABLE COMMUNICATION AMONG OPEN CLOUDS, AUTHOR: Amjad Mehmood, YEAR: 2018

Since clouds are working independently smooth, but standalone, cloud operation is complex. Therefore the need of interoperability and portability with other clouds come into play which increases the scope of the cloud environment. Then, the security threats are increased in the cloud environments. In order to address the problem, a Agri culture Multi-Agent based framework for Communication among Open Clouds is proposed in this paper. In the framework, each cloud has a Agri culture Mobile Agent which is responsible of the Agri culture communication among clouds.

Mobile Agents is performed by the Directory Agent. Directory agents are included in order to avoid the joining malicious or attacker mobile agents into the cloud. The theoretical and practical results show that Multi-agent based framework is more reliable and Agri culture than other cloud environments [9].

Advantage:

- To reduce the risk assessment for each mobile agent server.
- High performance of multi agent using cloud infrastructure

Disadvantage:

- Distributed among several repositories, and the existence of various and incompatible standards, technologies and interoperability layers among repositories, constitutes to the cloud services.

Survey 2:

TITLE: MOBILE AGENT BASED MULTI-LAYER SECURITY FRAMEWORK FOR CLOUD DATA CENTERS

AUTHOR: Mueen Uddin1*, Jamshed Memon2, Raed Alsaqour3, Asadullah Shah4 and Mohd Zaidi Abdul Rozan2

YEAR: 2019

This paper proposes a new mobile agent based cloud security framework comprising four different security and authentication layers to establish the trust relationship between two entities before using cloud services. The proposed framework is divided into four layers with each layer performing authentication, verification and integrity at different levels of communication between two entities. An algorithm is used to check and analyze the validity and functionality of each layer. Mobile agents are used as main components for performing different tasks assigned and requested by clients from cloud service providers. This makes the whole process transparent and clear according to users and cloud service providers' perspective [10].

Advantages

- Mobile agent moves computation code to data, and the intermediate results passing are reduced. The network bandwidth consumption is reduced.
- Agent operates asynchronously and autonomously, and the user doesn't need to monitor the agent as it roams in the Internet. This saves time for the user, reduces communication costs, and decentralizes network structure.

Disadvantage:

- Security issues like accessibility, vulnerabilities, virtualization vulnerabilities, and web application vulnerabilities are too high [11].
- High complexity of framework maintenance

Survey 3:

TITLE: AGENT BASED INFORMATION SECURITY THREAT MANAGEMENT FRAMEWORK FOR HYBRID CLOUD COMPUTING, AUTHOR: Muhammad Imran Tariq, Shahzadi Tayyaba , Muhammad Usman Hashmi , Muhammad Waseem Ashraf3 , Natash Ali Mian4,YEAR: 2020

Security threats are associated with each service and deployment model, vary and depend on wide range of factors including the sensitivity of information, resources and architectures. Threat Agent is an individual or group that exploits vulnerabilities, manifest a threat and conduct damaging activities [12].

The core objectives of this article is to present Agent based information security threat management framework for better understanding from threat identifying process to apply countermeasures. software and intelligent agent concepts that gather appropriate, relevant, variety of information relates to Information Security to use in proposed framework and to develop system that facilitates organization to define, update, propose, validate and apply measure against each threat agents [13].

Advantage:

- One of them is less dependable in previous values
- The capability to utilize the knowledge solicited from human decision. Inaccurate data and unclear statements are used as inputs to the system which resultantly produced decision values on outputs.

Disadvantage:

- Loss of control, recovery, backup failures, loss of encryption keys, unauthorized access and attacks.

Survey 4:

TITLE: A NOVEL AGENT BASED AUTONOMOUS AND SERVICE COMPOSITION FRAMEWORK FOR COST OPTIMIZATION OF RESOURCE PROVISIONING IN CLOUD COMPUTING ,AUTHOR: AartiSingha,DimpleJunejab, ManishaMalhotraa,YEAR: 2021

One of the key functionalities of this type of computing is to allocate the resources on an individual demand. However,

with the expanding requirements of cloud user, the need of efficient resource allocation is also emerging. The main role of service provider is to effectively distribute and share the resources which otherwise would result into resource wastage. In addition to the user getting the appropriate service according to request, the cost of respective resource is also optimized. To proposes a new Agent based Automated Service Composition (A2SC) algorithm comprising of request processing and automated service composition phases and is not only responsible for searching comprehensive services but also considers reducing the cost of virtual machines which are consumed by on-demand services only [14].

Advantage:

- Level of uptime
- Maximum resource capacity
- Percentage of timely service provisioning requests
- Average response time

Disadvantage

- It does not aim at using this risk-based provider selection.
- It does not ensure Agri culture multi-domain collaboration in cloud.
- It does not compare the new coming cloud service providers with existing cloud providers.

3. Proposed System

In previous examples we had discussed the benefits of edge computing for predictive and low-latency applications. Edge computing reduces communication and computational latency by moving resources closer to points of data origination. A hierarchy of edge computing resources distributed in communications infrastructure allows for the measurement and monitoring of network characteristics between two edge-enabled network boundaries. Observation of network conditions by edge resources can be used by Software Defined Networking (SDN) controllers to manipulate low-level communications infrastructure data paths to improve communications. Edge computing technologies must participate actively in communications networks, discovering edge enabled network topologies, relaying link characteristics between edge nodes, and by reporting observed network characteristics to low-level communication control systems [15].

The basis for application of new technologies in organizations is supported by the continuous analysis of data and information from multiple sources. Cloud Framework is one of the new technologies that, in association with the concepts and principles of Industry 4.0, could generate gains and improvements. Much has been said about the potential of Cloud Framework technology, its benefits, and its disruptive impact in various areas, including supply chain management. In the academic field, however, the development of this topic is in full swing, as a growing number of scientific studies have been published without a theoretical convergence of their foundations, concepts, and authors being noted [16]. Thus, considering the initial stage of the scientific debate of this object of analysis, this research aimed to understand the scenario of the adoption of Cloud Framework in supply chain management based on academic publications evidencing its characteristics and benefits, through a systematic literature review. Due to profound analysis, characteristics and benefits of its application on supply chain management as transparency, confidence, information decentralization, and information security are disclosed in this study. The improving technologies have increased the quality of the health care system drastically. Introduced smart services, and smart transportation and brought the government to authorize the systematic workflow of pharmaceutical supply chains. However, technological growth for efficient infrastructure implementation is on its way. It is a great advantage to use Cloud Framework technology in the Supply Chain Management system for systematic and strategic management to create value for increased customer satisfaction. Introduced Ethereum Cloud Framework for better pharmaceutical supply chain management. Using Cloud Framework in supply chain management increases efficiency, transparency, security and provides immutable data with complex encryption algorithms [17].

4. Implementation

Modules:

1. Data Processing 2. Computational Models 3. Operational Principle 4. Cloud Architecture 5. Cloud Edge Characteristics

4.1. Data Processing

Data processing functions provide the ability to communicate, exchange, and modify data in and between points of data generation.

• Real-time data operations such as data altering, aggregation, and complex event analytics.

• In-line data and protocol exchange, translations, and transformation.

Command and Control

- Command and control functions provide framework intelligence and operations management capabilities.
- High-level message passing for both control and data processing operations.
- Device, CI, and global application provisioning and coordination of resources.
- High-level CI description language to be used in resource management orchestration.

- Discovery services to determine operational topology and potential resources.

Global Visibility and Actions

- Provide a global view of resource topologies with correlated monitoring and measurement of underlying resources.
- Provide a global view of application topologies with key performance indicator
- Reporting.
- Provide global scheduling services, based on static and dynamic methods.
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4.2 Computational Models

The Cloud framework is heavily influenced by previous work in Actor and Agent-based computational models as described below.

Actor Model

On an abstract-level Cloud framework processes are based on Actor-model distributed concurrency. In this model an Actor is a primitive unit of isolated computation that uses asynchronous messaging to communicate with other Actors. While the details of the Actor-model are beyond the scope of this dissertation, basic operations of Actors include message-based creation of more Actors, Actor-to-Actor messaging, and the generation of state decisions applying to the next arriving message. Erlang, an example of a popular programming language based on the Actor-model, introduced a "let it crash" philosophy for distributed computation. Instead of focusing on defensive programming to prevent failures, using an offensive (create, monitor, and verify) philosophy one relies on Actors to supervise other Actors creating "selfhealing" distributed processing environments. In addition, the isolated operation of Actors makes continuous self and supervisor reporting of KPIs across heterogeneous environments possible [18].

Agent-based Model

Agent-based modeling (ABM) is a computational model used in the simulation of agent interaction. There exists a large body of research for ABM across many disciplines, including: biology, economics, social sciences, and engineering. We are not developing agent programming, which is an existing large area in the methodology of programming, but rather use an existing framework provided by

- An agent provides one or more useful services that other agents may use under specified conditions.
- An agent includes a description of the services ordered by the software, which may be accessed and understood by other agents.
- An agent includes the ability to act autonomously without requiring explicit direction from a human being.
- An agent includes the ability to succinctly and declaratively describe how an agent determines what actions to take even though this description may be kept hidden from other agents.
- An agent includes the ability to interact with other agents, including humans, either in a cooperative, or in an adversarial manner, as appropriate.

Experimental Results and Analysis

Improved Security

Cloud Application Framework improves the security of numerous IT companies. The data which are stored in the cloud are always stored behind the firewall. Therefore, it can only be accessed by the user after providing the password. The cloud servers provide strict security checks. To infringe on these securities one needs to go through the fine permission as well as multi-factor authentication. Cloud servers protect the data from data breaches and attacks of malware. Storing data on off-site cloud servers is safer than storing it in the office arena.

Promotes Remote Work

Cloud Computing promotes a remote work culture. With the assistance of the internet, clouds store data at an isolated location. Therefore, this new transition to remote work can be witnessed at large IT companies. This boosts the work efficiency of the organization and encourages real-time collaboration. This gives rise to a conflict-free environment where employees can work, create, and accomplish many projects.

Highly Dependable

Cloud Application Framework ensures that services never get disconnected with the help of numerous technologies. Cloud servers are spread across a large area to avoid any kind of service interruption. This strategy does not leave a single scope ground for the failure of cloud services. With the assistance of such an advanced strategy, service providers can rapidly resolve problems without

disconnecting the entire cloud service. Therefore, the entire Cloud Computing technology has emerged to be highly dependable.

Improves Scalability

Cloud Computing is ideal for small-scale companies. Cloud Computing reduces the cost of the physical infrastructure for these start-ups and allows them to pace up according to their flexibility. As an example, a scalable cloud computing server regulates the traffic of a website and without disconnecting the entire cloud service.

KPIs to Measure Cloud Optimization

Optimization is the process of finding opportunities to be more efficient and reduce spend or save time, without sacrificing functionality or required resources needed to meet your broader business objectives. While mature organizations might already have robust cloud cost optimization practices (e.g. rightsizing, elimination of zombie infrastructure, reservation management, etc.), optimization isn't just about cost. Operational optimization involves finding opportunities to be faster and more efficient at day-to-day tasks, and security optimization is the process of proactively monitoring and suggesting remediation of security and compliance risks [7].

Key cloud metrics to track Servers/nodes available

For distributed cloud environments, you should track how many servers or nodes within your cluster are up and available as a percentage of the total servers you have deployed. Although your cloud orchestration and automation tools may do a good job of automatically redistributing workloads from one node to another if a server goes down, they can only do that for so long before running out of healthy servers. You'll want to know if the number of available servers' decreases beyond about 90 percent of the total deployed, which could indicate a serious problem with your cloud server instances.

Average compute cost

Tracking the total average cost of your cloud-based compute resources, such as virtual machines or serverless functions, in a given period will help you control costs. A spike in compute cost that can't be explained by a corresponding increase in application demand could signal an overprovisioned environment, for instance, which will waste money until it is corrected.

Average storage cost

You can also track the average cost of your cloud storage resources, including databases, object storage and block storage. Here again, storage cost increases that aren't tied to actual application needs could indicate a problem, such as improper data lifecycle management or inefficient use of data storage tiers.

5. Conclusion

A framework for integrating and analyzing agricultural data from various sources, which leverages cloud computing, thereby contributing to the scalability, flexibility, affordability, and maintainability of consequent solutions relative to existing solutions. The framework defines a functional infrastructure of cloud-based services that facilitate the integration, analysis, and visualization of data. It comprises four layers: the Data layer, which includes various databases (e.g., pest spreading data, meteorological data, water sample data), as well as linked-data (e.g., a pest-control ontology, which refers to such external ontologies as AGROVOC), and document files (e.g., best practice and guidelines); the Data Extraction, Retrieval, and Integration Service layer, which includes services such as IoT, data extraction, propriety data extraction and integration services, and an open-source ETL service; the Data Analysis layer, which includes GIS, data mining, and BI services; and the Application layer, which includes end-user applications (e.g., pest-control DSS and pest-monitoring services) that were created using the services in the underlying three layers. It should be noted that the framework is intended to integrate and process data from both existing external databases and new databases, this study attempts to investigate briefly how CF technology works and when it should be utilized to address supply chain challenges. CF technology is employed in SCM in a variety of sectors. The present state of use of CF and Smart Contracts in numerous major industrial domains is studied in this project. The survey delivers academically sound data on the overall state of CF deployment for various supply chains. The study's findings and conclusions show that research on CF-based supply chains is a growing topic garnering a lot of attention. The majority of the reviewed papers that were evaluated agreed on the prospective benefits that CF may offer to the supply chain.

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