A CLOUD COMPUTING SOLUTION FOR THE EFFICIENT IMPLEMENTATION OF THE I-SBAS DInSAR APPROACH

K.Sowmiya[1] ,S.Thiruvenkatasamy,[2] T.Sangeetha[3]
PG scholar[1], Assistant Professor[2], Assistant Professor[3]
[12] Nandha College of Technology,
[3]Sri Krishna college of engineering and technology
sowmiya.nkk7@gmail.com , sangee9110@gmail.com

Abstract

An efficient Cloud Computing implementation of the Intermittent Small Baseline Subset (ISBAS) algorithm, which is an advanced Differential Interferometric Synthetic Aperture Radar (DInSAR) technique for the generation of Earth surface displacement time series through distributed computing infrastructures. Ground motion as a consequence of natural geological processes or due to anthropogenic influences, is a considerable problem and concern to a variety of people and groups. These include the mining industry, insurance companies, government and not least the general population. Increased knowledge of subsidence patterns would benefit all parties involved however, often techniques used such as leveling and GPS have spatial or temporal shortfalls. Utilizing remotely sensed data and Differential Interferometric Synthetic Aperture Radar (DInSAR), the shortcomings of traditional measurement can be overcome, producing precise maps over wide expanses and over many years. DInSAR utilizes stacks of Synthetic Aperture Radar (SAR) imagery of the same area to derive ground motion rates with mill metric precision. A significant limitation of these techniques, be it utilizing small baseline or persistent scatterer methods, is the density of coverage it can achieve over dynamic rural environments. Interferometric analysis is not possible over large sections of the scene which can inhibit the identification of subsidence patterns, impeding the techniques efficacy. The Intermittent Small Baseline Subset (ISBAS) is an improved version of the established SBAS algorithm, designed to improve coverage over rural settings by considering intermittent coherence.

1. INTRODUCTION

Cloud computing is an expression used to describe a variety of different types of computing concepts that involve a large number of computers connected through a real-time communication network such as the Internet. In science, cloud computing is a synonym for distributed computing over a network and means the ability to run a program on many connected computers at the same time. The phrase is also more commonly used to refer to network-based services which appear to be provided by real server hardware, which in fact is served up by virtual hardware, simulated by software running on one or more real machines. Such virtual servers do not physically exist and can therefore be moved around and scaled up (or down) on the fly without affecting the end user arguably, like a cloud.

Overview Of The Project

Cloud computing is achieving increased popularity, concerns are being voiced about the security issues introduced through adoption of this new model. The effectiveness and efficiency of traditional protection mechanisms are being reconsidered as the characteristics of this innovative deployment model can differ

widely from those of traditional architectures. An alternative perspective on the topic of cloud security is that this is but another, although quite broad, case of "applied security" and that similar security principles that apply in shared multi-user mainframe security models apply with cloud security. The relative security of cloud computing services is a contentious issue that may be delaying its adoption.

1.1 CLOUD COMPUTING SECURITY

Physical control of the Private Cloud equipment is more secure than having the equipment off site and under someone else control. Physical control and the ability to visually inspect data links and access ports is required in order to ensure data links are not compromised. Issues barring the adoption of cloud computing are due in large part to the private and public sectors unease surrounding the external management of security-based services. It is the very nature of cloud computing based services, private or public, that promote external management of provided services. This delivers great incentive to cloud computing service providers to prioritize building and maintaining strong management of secure services. Security issues have been categorized into sensitive data access, data segregation, privacy, bug exploitation, recovery, accountability, malicious insiders, management console security, account control, and multi tenancy issues. Various cloud security issues vary, from cryptography, particularly public key infrastructure (PKI), to use of multiple cloud providers, standardization of APIs, and improving virtual machine support and legal support.

1.2 OBJECTIVES OF THE PROJECT

Leveraging AWS infrastructures features S3, EC2 scalability, MySql to store, process, manipulate give more flexibility to implement to web features like open portal for end users. Due to the increasing popularity of cloud computing, more and more data owners are motivated to outsource their data to cloud servers for great convenience and reduced cost in data management.

2. EXISTING SYSTEM

Parallel Small BAseline Subset (PSBAS) is a SAR raw data focusing up to the displacement time-series generation. PSBAS is one of the DInSAR technique used mainly for spatial data analysis with less denser points. Evaluating and comparing the scalable performances of the developed P-SBAS NFS-based DS implementation with those based on the CS implementation. The total processing time of the PSBAS sequential execution is 478.8 h and, starting from this time, which can computed the sequential fraction of the processing, which represents the 3.7%. did not execute the 2 and 4 nodes runs because they would have not been significant for the objective of analysis, which is the investigation of the P-SBAS performances when the number of computing nodes increases, i.e., when maintaining the scalability becomes a critical issue.

The computing architectures that exploited for the comparison between the P-SBAS CC centralized and the presented DS implementations have been built up by exploiting the AWS EC2 resources located in the Ireland region. Among the available EC2 instances, selected those allowing us to demonstrate how the new implementation overcomes the network bottleneck problem, which characterized the CS implementation leading also to a significant cost reduction. In particular, instead of exploiting instances with the maximum network bandwidth available within EC2 (i.e., 10 Gb/s), satisfactory scalability, chose machines with

a network performance referred to as "high," which is around 1 Gb/s.

The following are the drawbacks of the system:

- Generates less denser points for rural areas.
- P-SBAS does not support spatial geological data analysis for Agricultural land, large firms.
- Need large scale data

3. PROPOSED SYSTEM

The Intermittent Small Baseline Subset (ISBAS), which, compared with the Small Baseline Subset (SBAS) method, appears to improve results over natural, woodland and agricultural terrain. Differential Interferometric Synthetic Aperture Radar (DInSAR) Technique is generated. DInSAR used to observe very large areas in the Earth's Surface deformation. Build more cost effective and implement rural coverage system using Intermittent Small Baseline Subset (ISBAS), Differential Interferometric Synthetic Aperture Radar (DInSAR) algorithm.

3.1 Advantages

- ISBAS technique is the generation of denser point coverage than the standard SBAS method especially over rural areas.
- Cost effective.
- Computing Scalable and load balancing enabled.

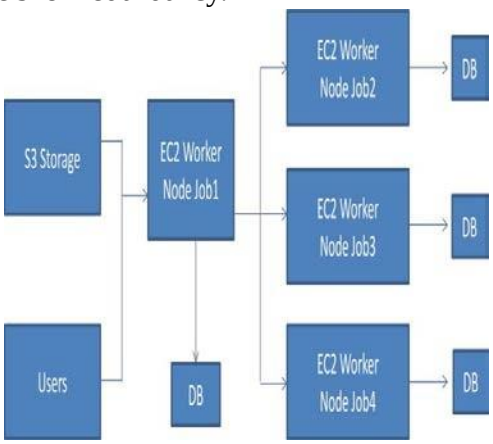
4. SYSTEM METHODOLOGY

The computing architectures that we exploited for the comparison between the P-SBAS CC centralized]and the presented DS implementations have been built up by exploiting the AWS EC2 resources located in the Ireland region. Among the available EC2 instances, we selected those allowing us to demonstrate how the new implementation overcomes the network bottleneck problem, which characterized the CS implementation leading also to a significant cost reduction. In particular, instead of exploiting instances with the maximum network bandwidth available within EC2 (i.e., 10 Gb/s), reached satisfactory scalability, we chose machines with a network performance referred to as "high," which is around 1 Gb/s. This reduction for the requested network bandwidth permitted us to save about 42% of the costs related to the instance payment. More precisely, for our experimental analysis, both as master and worker nodes, we selected the m4.4xlarge machines because they have got characteristics satisfying the P-SBAS requirements in terms of RAM capacity and processor (number of cores), but with the above-mentioned 1 Gb/s network capability and with a configuration optimized for the Amazon storage volumes (Elastic Block Store, EBS). This means that these instances have dedicated connections to the storage disks to which are attached. The characteristics of the m4.4xlarge instances are shown in details. Note that, throughout our analysis, we refer to an instance as to a single computing node. Moreover, for the CS implementation, as a shared common storage volume, we selected an IOPS(Input Output Operation per Second) provisioned SSD storage volume, ensuring very high I/O performances. In particular, we configured the volume with 16 000 IOPS, which correspond to 250 MB/s disk access bandwidth, which is the maximum throughput achievable by the m4.4xlarge instances. The volume size depends on the overall amount of data produced by the P-SBAS processing and this storage volume has been attached to the master node. Clearly, the storage configuration cannot disregard the network capability because, during the parallel steps of the P-SBAS processing, the data to be

read and written on the common storage are transferred via network; consequently, the actual I/O bandwidth is given by the minimum between the disk access and the network bandwidth. Concerning the DS implementation, instead, each computing node of the implemented platform had attached its own storage volume. In this case we exploited an IOPS provisioned SSD storage volume with 1000 IOPS for each worker node, and 4000 IOPS for the master node, as this latter one, in several steps of the P-SBAS processing, performs more I/O operations than the other nodes. In these experiments, we carefully set the I/O performances strictly necessary to sustain the I/O workload of each computing node.

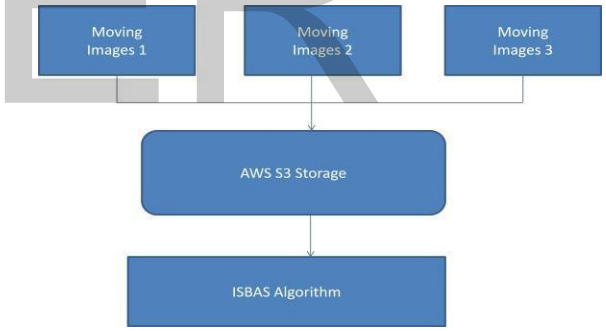
5. SYSTEM ARCHITECTURE

Simple Storage Service is storage for the Internet. Online file Storage Web service interfaces (Representational State Transfer, Simple Object Access Protocol). S3 allows users to enable or disable logging. If enabled, the logs are stored on Amazon S3 buckets which can be analyzed. AWS allowing user to rent virtual computers on which to run their own computer application. EC2 provides users with control over the geographical location of instances that allows for latency optimization and high levels of redundancy.



5.1 Spatial Image Data Collection

Enable users to import spatial data to AWS S2 server. Allow users to manage spatial data using EC2 server. Provides user interface for create, update, delete, list spatial data and view historical logs for auditing purpose. In investigate the scalable capability of the proposed solution, exploiting the AWS Elastic Cloud Compute (EC2) public platform performed two kinds of analyses. The former, aimed at evaluating the scalable performances achieved with the P-SBAS NFS DS implementation, has been developed in continuation of the outcomes, the obtained results show how the new implementation leads to performance improvements even with-out exploiting machines with very high-performing features and capabilities, thus also permitting a significant reduction of the corresponding costs relevant to the PSBAS processing.

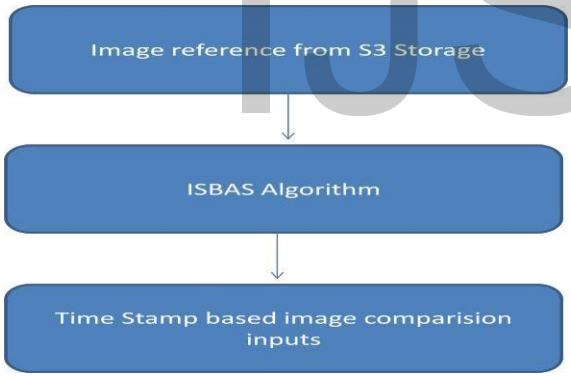


Spatial Image Data Analysis

5.2 ISBAS Algorithm

DInSAR Technique Surface Deformation Analysis. Exploiting AWS Elastic Cloud Compute (EC2) in Public Platform. Denser Point Cloud created by 3D Scanners. This research focus on the method termed here, the Intermittent Small Baseline Subset (ISBAS), which, compared with the Small Baseline Subset

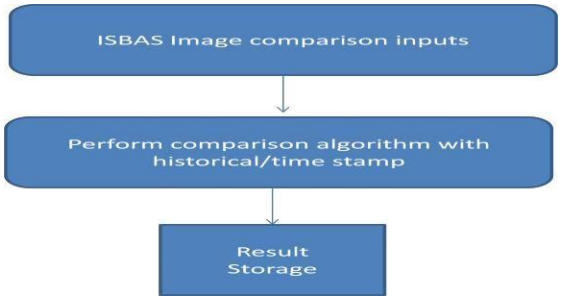
(SBAS) method, appears to improve results over natural, woodland and agricultural terrain. A major limitation of long-time-series DInSAR is that the analysis is generally restricted to points that are of a consistently high coherence throughout the whole time series, meaning the spatial distribution of points is often inadequate to characterize a large-scale feature that persists across a range of land-cover types. Here the authors present a solution with the ISBAS method, that utilizes pixels that are intermittently coherent over time in addition to those that are consistently stable over all observations. The algorithm is based upon a minor modification of the well-established low pass SBAS. A major limitation of long time-series DInSAR is that the analysis is generally restricted to points that are of a consistently high coherence throughout the whole time series.



ISBAS Algorithm

5.3 ISBAS Comparison

Small Baseline Subset (SBAS) Method and the Comparing historical images with current image using ISBAS algorithm and provides predictive reports for geological monitoring dashboard. Enable data input for monitoring dashboard from the backend. Soil moisture is a key parameter in different environmental applications, such as hydrology and natural risk assessment. In this paper, surface soil moisture mapping was carried out over a basin in France using satellite synthetic aperture radar (SAR) images acquired by C-band (5.3 GHz) sensors. The comparison between soil moisture estimated from SAR data and in situ measurements shows good agreement, with a mapping accuracy better than 3%. This result shows that the monitoring of soil moisture from SAR images is possible in operational phase. Moreover, moistures simulated by the operational Mét&eacuteo-France ISBA soil-vegetation-atmosphere transfer model in the SIM-Safran-ISBA-Modcou chain were compared to radar moisture estimates to validate its pertinence. The difference between ISBA simulations and radar estimates fluctuates between 0.4 and 10% . The comparison between ISBA and gravimetric measurements of the 12 March 2007 shows a RMSE of about 6%. Generally, these results are very encouraging. Results show also that the soil moisture estimated from SAR images is not correlated with the textural units defined in the European Soil Geographical Database (SGDBE) at 1:1000000 scale. However, dependence was observed between texture maps and ISBA moisture. This dependence is induced by the use of the texture map as an input parameter in the ISBA model. Even if this parameter is very important for soil moisture estimations, radar results to differentiate moistures zones.



ISBAS Comparison

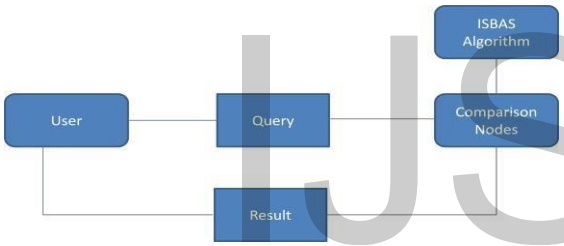
5.4 Data Distribution

Statistic Graphical Methods It having some types for distribution data

- Dot Plots
- Histograms
- Box Plots
- Tally Charts

5.5 Query Module

Module enable end users to query geological changes based on timestamp. Helps users to interact with system with various filter options. Module interact with S3 and Mysql for data and result references. S3 references for spatial images snapshots and Mysql for preprocessed historical data results.



Query Module

6. CONCLUSION

The main objective of this project is to improve the geological survey and monitoring for rural area. Applying ISBAS DInSAR algorithm to collected spatial data and finding/ sensing geological changes. The collection spatial data and store it into could S3.The second phase of this project is to concentrate on implementation of the application software in AWS. Providing interface to store/retrieve spatial data from/to S3 over EC2 master node. Implement alerting mechanism and dashboard for monitoring using Differential Interferometric Synthetic Aperture Radar technique and Intermittent Small BAseline Subset (ISBAS). ISBAS which compared with the small baseline subset method, appears to improve results over natural, woodland and agricultural terrain on implementation of the application software.

7. REFERENCES

[1] Berardino P, Fornaro G, Lanari R, and Sansosti E,(2002), "A new algorithm for surface deformation monitoring based on small baseline differential SAR interferograms," IEEE Trans. Geosci. Remote Sens., vol. 40, No. 11.

[2] Berardino P, Fornaro G, Manunta M, Sansosti E, and Serafino F, (2006), "Geometrical SAR image registration," IEEE Trans. Geosci. Remote Sens.,vol. 44, No. 10.

[3]Manunta M, Mora O and Sansosti E,(2004), "A small-baseline approach for investigating deformations on full-resolution differential SAR interferograms," in IEEE Trans. Geosci. Remote Sens., vol. 42, No. 7.

[4] Berardino P, Lanari R, Pepe A, and Sansosti E, (2005),"On the Generation of ERS/ENVISAT DInSAR time-series via the SBAS technique," IEEE Geosci. Remote Sens. Lett., vol. 2, No. 3. Brandstatter K, Garzoglio G, Li T ,Maheshwari K, Martin J H, Pais Pitta de Lacerda Ruivo T, Raicu I, Sadooghi I, Timm S and Sand Zhaootential of cloud computing for scientific applications," in IEEE Trans. Cloud Comput., vol. PP, No. 99.

[5] Casu F, "SBAS-DInSAR parallel processing for deformation time series computation," IEEE J. Sel. Topics Appl. Earth Observations Remote Sens., vol. 7, no. 8, pp. 3285–3296, Aug. 2014.

[6] Casu F, Lanari R, Manzo M, and Sansosti E,(2010),"Space-borne radar interferometry techniques for the

generation of deformation time series: An advanced tool for Earth's surface displacement analysis," Geophys. Res. Lett., vol. 37.

[7] De Luca C., (2015),"An on-demand web tool for the unsupervised retrieval of earth's surface deformation from SAR data: The P-SBAS service within the ESA G-POD environment," Remote Sens., vol.7.

[8] De Zan F and Monti Guarnieri A M, (2006) "TOPSAR: Terrain observation by progressive scans," IEEE Trans. Geosci. Remote Sens., vol. 44, No. 9. Faraboschi P , Gioachin F, Gupta A, Kale L V, Kaufmann R, Lee B S, March V, Milojicic V, and Suen C H,(2014),

[9] "Evaluating and improving the performance and scheduling of HPC applications in cloud," in IEEE Trans.Cloud Comput., vol. PP, No. 99.