Very Small Aperture Terminal (VSAT) Quality of Service Improvement Algorithm Using Inverse Cloud Computing Approach

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Abstract

This paper discusses the improvement of the quality of services of communication between satellite network and VSAT adopting inverse cloud computing. The main objective of this paper is to develop an algorithm to improve the quality of services of communication between satellite and VSAT. The algorithm works to reduce the ratio of delay of communication in network and also reduces the ratio of bit error rate resulting of interference and attenuation of the signal. This paper used Matlab language version 7.9.0 (R2009b) to implement the simulation program and analyzes the obtained data. The important results obtained show an improvement of quality of services in VSAT. Compression algorithm recommended to be used to improve the quality of services in VSAT to reduce the delay of transmission and to reduce the noise in the network. Also an inverse cloud approach is used to reduce the BER and improve the throughput.

Keywords: *VSAT, improvement the quality of service, cloud computing.*

1. Introduction

The Very Small Aperture Terminal (VSAT) is an evident from the name given to the ground stations of small size in particular, but in general it is a communications system used to connect different networks via satellite, is one of the services offered to users who wish to independent communications network linking a large number of geographically dispersed locations such as institutions and government departments to link their parts with each other, whether inside or outside the country , on land or at sea.[2][4]

The Technology is the VSAT one applications low cost for users wishing to independent communications network connecting a large number of sites scattered geographically, and networks offer the VSAT value-added services via satellite capable of supporting Internet services and data transmission services, LAN, voice services and fax an able to provide solutions for private communications networks and reliable public. [2]

2. Cloud Computing Network

Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.[8]

2.1 Service Models of cloud computing:

The Service Models of cloud computing can classified of the following:

• Software as a Service (SaaS).

The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure2. The applications are accessible from various client devices through either a thin client interface, such as a web browser (e.g., web-based email), or a program interface. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment. [8]

- Platform as a Service (PaaS).

The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages, libraries, services, and tools supported by the provider.3 The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment.

• Infrastructure as a Service (IaaS).

The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, and deployed applications; and possibly limited control of select networking components (e.g., host firewalls).

2.2 Deployment Models of the cloud computing:

- Private cloud.

The cloud infrastructure is provisioned for exclusive use by a single organization comprising multiple consumers (e.g., business units). It may be owned, managed, and operated by the organization, a third party, or some combination of them, and it may exist on or off premises.

- Community cloud.

The cloud infrastructure is provisioned for exclusive use by a specific community of consumers from organizations that have shared concerns (e.g., mission, security requirements, policy, and compliance considerations). It may be owned, managed, and operated by one or more of the organizations in the community, a third party, or some combination of them, and it may exist on or off premises.

• Public cloud.

The cloud infrastructure is provisioned for open use by the general public. It may be owned, managed, and operated by a business, academic, or government organization, or some combination of them. It exists on the premises of the cloud provider. [1][8]

- **Problem statement**

In this paper the following problems are addressed:

The VSAT network uses the satellite which has a great transmission delay. An interactive multimedia over VSAT suffers from the low data rate and high Delay. The satellite link might face an interference or high noise which leads to a high bit error rate. Limitation of computer aided design and planning of the VSAT network.

- **Objective statement**

The main objective of this paper includes:

Adopting an efficient compression algorithm to reduce the delay of transmission and maximizes the data rate. To reduce the high bit error and noise in network. To select suitable topology with an effective performance.

3. Methodology

- Propose algorithm for Delay reduction and data rate maximization.
- Using the Matlab language to simulation the algorithms and determine its efficiency.
- Representing the results graphically by using Microsoft excel 2010 and Matlab language.

4. Analysis and Results

The researcher seek for this paper to design simulation program to improve the quality of services in VSAT that with design compression algorithm this shows in the results presented in Table 1 and Table 2.

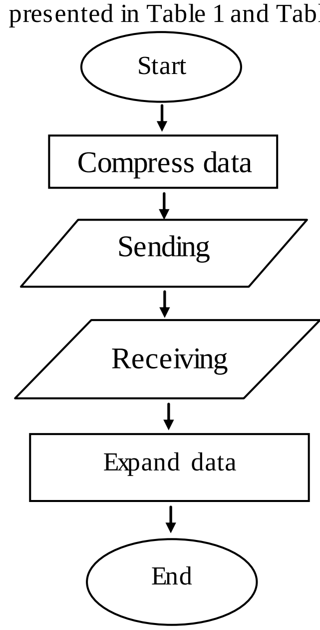

Fig. 1 Algorithm flow chart.

first step start the algorithm, and in step two begin to compress data any kinds of data such as: text, voice, video,…, in step three starting transmit of data throw the satellite channel from transmitter, step four received compress data from receiver, step five expand the compress data to use, and step six finish the algorithm. This is shown in the above Figure.

4.1 Results before compression algorithm

Table 1 Shown the improvement of delay before compression algorithm.

Average SNR of noise bandwidth		*Average SNR of VSAT power transmitter*	
Value[MHz]	*Average SNR[dB]*	*Value[Watt]*	*Average SNR[dB]*
500	15.34383	12	1.53438
600	12.78653	24	3.06878
700	10.95987	50	6.39328
800	9.58991	100	12.78654
900	8.52434	200	25.57305
1000	7.67192	300	38.35959

4.2 Results after compression algorithm

Table 2 Shown the improvement of delay after compression algorithm.

CE	*Delay [ms]*	*Improvement %*
20%	100-9.0	91%
30%	100-4.7619	95%
40%	100-3.2258	96%
50%	100-2.4390	97%
60%	100-1.9608	98%
70%	100- 1.6393	98.3%
80%	100-1.4085	98.5%
90%	100-1.2346	98.7%

5. Discussion

Table 1 and Table 2 illustrate the improving in delay before and after compression algorithm. Before compression algorithm the output result, is when increase the power transmitter of VSAT the average of signal-to-noise ratio is increase and delay of transmission is improve, this shown in below Figure 3. And also explain result when increase the noise bandwidth of VSAT the signal-to-noise ratio is decrease this is shown in below Figure 4. After compression algorithm the result and output is when increase the ratio of compression the ratio of improving in delay is increase this show in Figure 5.

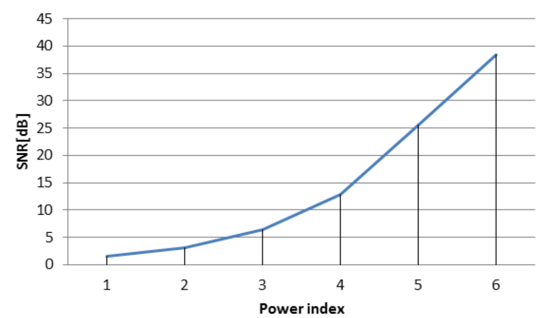

Fig. 3 Average SNR of VSAT Power Transmitter.

- In Figure 3 x-axis = Power Transmitter and y-axis = signal-to-noise ratio.

The equation, used in the compression algorithm, to calculation propagation delay (Tpa) as the following:

$$Tpa(1,k) = Tp / Ce(1,k)$$

Where Tp = propagation delay. And Ce = compression algorithm efficiency.

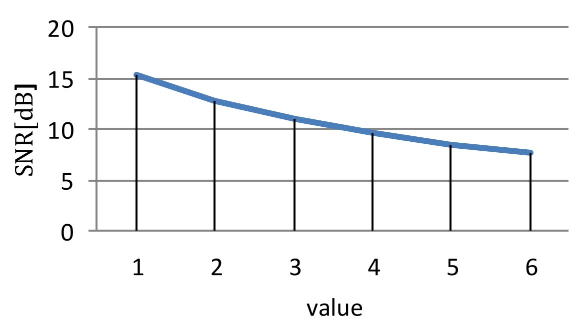

Fig. 4 Averages SNR of Noise Bandwidth.

- In Figure 4 x-axis = noise bandwidth and y-axis = signal-to-noise ratio

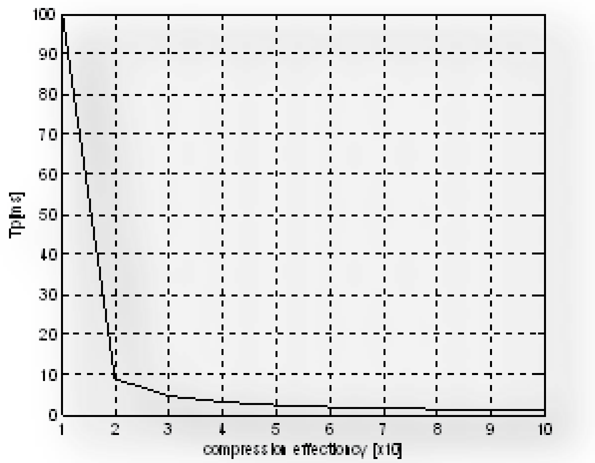

Fig. 5 Improvement in delay after Compression Algorithm.

6. Conclusion

From this paper the following can be concluded.

- The average of signal to noise ratio increase with increment the power transmitter.
- The average of signal to noise ratio decrease with increment noise bandwidth.
- The orbit high is also important affected parameter of vsat work because when the orbit nears to the earth that improving the vsat work as well as reduce the delay and bit rate.
- As well as number of earth station and distance between each station is helping to improve the vsat services.
- Compression algorithm is important in use to reduce the delay in satellite and vsat network.
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7. Recommendation

After this paper recommended to the following.

- Increases the powers signal transmit of vsat by to improve the quality of services.
- Decrease the noise bandwidth to improve the quality and minimize the BER.
- Recommended to use compression algorithm to reduce delay in satellite network.

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