

# Reduce Delays in end to end DVB-RCS Satellite Networks

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**Abstract**— In today's satellite network to a return-channel for communication between terminals used in the DVB-RCS standard is provided by this feature. In order to allocate the bandwidth of the standard protocol used is called DAMA where algorithms such as CRA, RBDC uses to request bandwidth Since these methods are simple in this paper try to improve the RBDC algorithm until parameter end to end delay in networks is particularly important for satellite networks will decrease.

**Key words:** *RBDC, MF-TDMA, DVB-RCS, Delay, DAMA.*

## I. INTRODUCTION

We know today's satellite networks are considered as a real complement to terrestrial networks. In fact, in order to increase the reliability of satellite's channels terrestrial technologies will be used. Another reason of using the satellite network can be wide covered of geographical satellite networks which this issue is more important in remote areas. With all known advantages of satellite networks, the major weakness is long delay of traffic in the satellite because for each communication between terminals must use a link to pass the traffic from satellite. In this paper we attempt to reduce delays.

Here GEO satellite is used from GEO and LEO satellites. In addition, among existing standards for satellite networks the DVB-RCS standard [2] because of the first and most comprehensive standard is used. To improve the standard DVB-RCS, DVB-S standard was released in which was developed by a European Institute in 2001. This standard provides return channel for sending broadband traffic. The advantage of DVB-RCS standard than DVB-S standard is to send traffic by the terminal in which terrestrial network is not required, but it can be possible by the DVB-RCS standard implementations in the satellite.

First of all, in this article the types of DVB-RCS satellite networks will be mentioned, available standard satellite networks and then the way to access the broadband of sending will be explained. Afterwards the method of using the new algorithms and finally the result of simulation and evaluating of the methods and suggestions will be mentioned. It must be noted that ns-2 simulation is used for comparing standard algorithms RBDC [1] and Pure RBDC.

## II. DVB-RCS SATELLITE NETWORKS

### A. Transparent Satellite

Transparent satellite traffic from the terminal receives the traffic without any additional processing on the incoming traffic to the other terminal sends on earth. for this type of satellite on the earth is required hub until to convert DVB-RCS frame to DVB-S frame.

In this type of satellite any connection possible by star topology. Means for link with the terminal require Hub, for terminal their information send to other terminal this should doing via hub. Star topology is composed of terminals and hub. Figure 1 shows this issue is available.

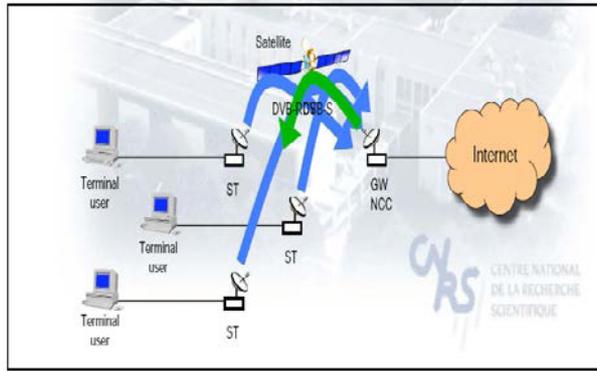


Figure 1: Star topology in Transparent Satellite

**B. Regenerative Satellite**

In this type of satellite, hub responsible resource management, against transparent satellites, hub embedded in the satellite. In fact, this type of DVB-RCS Satellite Onboard switching able to separate received traffic and after the required processing on the traffic mix them together and sends the desired terminal And Several signal DVB-RCS multiplex to only single DVB-S signal.

In this type of Satellites, topology used to communication various components can be Star or Mesh. when of star topology use that only between hub and terrestrial terminals be communication. In addition, if each of its terminals are connected to the Hub directly from the satellite are in direct contact in this case the network topology used in the DVB-RCS Regenerative satellite of the Mesh. To better understand the issue both Star and Mesh topology is in the figure (2) shown.

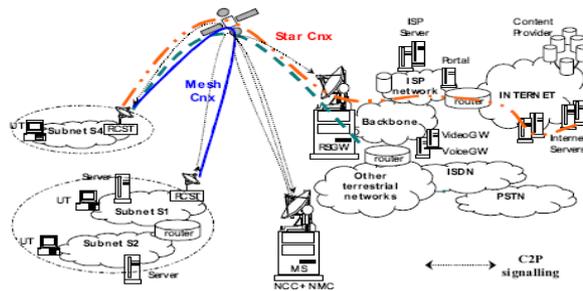


Figure 2: Star and Mesh Topology in the Regenerative Satellite

In simulation existing in this article used transparent satellite or repeater that delay send and receive data as follows:

Delay through the network of satellites is about half a second. This means that to send traffic from terminal to hub and then back to the applicant terminal bandwidth takes about half a second. It should be noted that this type of satellite because, NCC or Network Control Center (The same is the hub) is located in the earth, first message sent by the terminal passing through the satellite and then send to the Hub. In fact, these types of satellites in two steps (at least one second) to connect two users (communication point to point) are required. Figure 3 shows this issue.

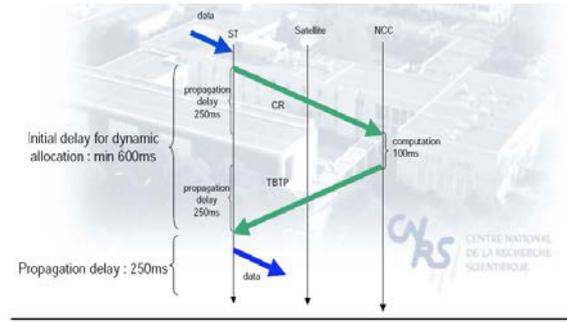


Figure 3: Delay of Transparent Satellite and Dynamic Allocation

### III. HOW ACCESS TO SEND BANDWIDTH

In DVB-RCS standard the method MF-TDMA [3] doing for data framing. In fact, The MF-TDMA is composed of a number frames that any frame includes of number time slot. Each terminal proportional to received traffic, certain number of time slots allocated in any super frame. DVB-RCS standard mechanism DAMA uses to access the required bandwidth. In fact, any terminal at any time to determine how much bandwidth needs, terminal must send the request to NCC. According to, request of various terminals arrived to NCC that decides how much bandwidth to allocate for each terminal. If Network control center to detect that no congestion the network, the total requested bandwidth is allocated to the terminal. According to above was determined that a terminal to the allocated bandwidth for send traffic should be requested from the satellite terminal to the NCC and then the NCC to the satellite terminal to Allocation Bandwidth be informed by control frames. This round-trip showing that high satellite delay. DAMA mechanism can the request bandwidth be changed dynamical by the satellite terminals. Dynamics of bandwidth on the satellite terminals according to the needs of the network control center to request bandwidth, until DAMA avoid waste of satellite bandwidth.

As stated by one of the ways in which the request was RBDC the request bandwidth according to bandwidth on demand terminal traffic to terminal were calculated. Since this method when traffic is non-permanent and variable rate works fine but when we have no good performance for burst traffic, the reason is that the current request does not fit with current Bandwidth Allocation and in queue of terminals are accumulated packets, resulting in increased delays. Why in this article apply this method with the bandwidth of the terminals have improved the performance of the new algorithm is shown in detail in the next section.

### IV. THE NEW ALGORITHM MECHANISM

Since RBDC method the suggestion in the DVB-RCS standard based input rate on the terminal of the traffic needed to apply new algorithms to reduce delays in end to end instead of just the previous input rate to calculate the amount of traffic demand of each terminal we use 7 entry level background rate in the calculation we consider the rate of new entries. RBDC old algorithm has been implemented in NS-2 simulator [5] based on the rate difference between the current input rate and input rate is calculated that one earlier in the formula (1) shows the traffic rate:

$$\text{rate} = (\text{qMon\_} \rightarrow \text{barrivals} () - \text{pin}) / (\text{mac\_} \rightarrow \text{slot\_packet\_len\_} * \text{mac\_} \rightarrow \text{num\_frame\_}) \quad (1)$$

Variables defined in the formula are described below:

qMon\_ → barrivals (): Current input rate

pin: input rate to a level

mac\_ → slot\_packet\_len\_: the byte length of each slot

mac\_ → num\_frame\_: number of frames between two consecutive requests.

We present a new algorithm or Pure RBDC RBDC formula (2) to calculate the bandwidth demands have been used

$$\text{rate} = (\text{qMon\_} \rightarrow \text{barrivals} () - (\text{pin} + \text{pin0} + \text{pin1} + \text{pin2} + \text{pin3} + \text{pin4} + \text{pin5}) / 7) / (\text{mac\_} \rightarrow \text{slot\_packet\_len\_} * \text{mac\_} \rightarrow \text{num\_frame\_}); // \text{ Pure RBDC} \quad (2)$$

Where Pin is the rate of incoming traffic in the previous step and Pin5 the input terminal B is at level seven. It should be noted that all previous stages of the default traffic is equal to zero. (Pin = 0)

As seen in this equation is the input rate is a step in the new request. .. (To be Pin)

In fact, with this new algorithm is more appropriate to the traffic rate of NCC requests to terminals. The other hand, the NCC has implemented an algorithm for the proportional allocation of bandwidth to terminals [6], which operates the terminal requests additional bandwidth more bandwidth is allocated proportionally to the terminal servers that are dedicated. In fact, the hub of the allocation formula (3) to determine the contribution of each terminal in each frames uses:

$$N_s * R_i / R \quad (3)$$

Where the variables are as follows:

Ns: Number of periods per frame

Ri: the number of requests I have terminal

R: When the terminal section of the application in each frame.

This unit represents the total allocation request unit (Ri) is calculated (R) and then to the terminal in accordance with the request, the allocation period. Naturally, it is much more bandwidth to the terminal I Ri I have to be allocated.

The new algorithm terminal when i have cut the number of requests (due to taking a step input rate) than the corresponding algorithm is RBDC. The operating result for the terminal when i have to be cut into more equitable. The end result of this reduction send and receive bandwidth will be delayed. Indeed, end-to-end delays are reduced, which is clearly seen in the simulations.

## V. SATELLITE SIMULATION RESULTS

### A. Simulation Platform

For algorithms that can RBDC, Pure RBDC together to compare the simulated conditions have provided the following:

Topology has been implemented in ten terminals through GEO satellites, which are connected to each other and are managed through a network control center. (Figure 4) Since the traffic is the same at all terminals to check the simulation bandwidth request algorithm on one of the terminals will Terminal\_0. Rate for a variable input to this terminal is 100 seconds. (Figure 5)

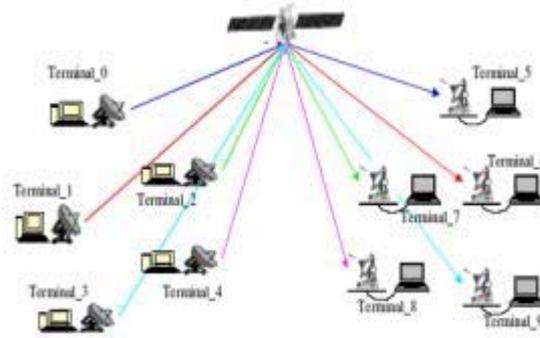


Figure 4: Structure of Network Topology

To create more traffic and network behavior in different situations, starting and ending time information of each node is regulated by uniform random functions. Thus in the simulation of network traffic conditions and the traffic in the conditions Traffic will be fixed. Typically, the input traffic rate is below the range of zero to the terminal.

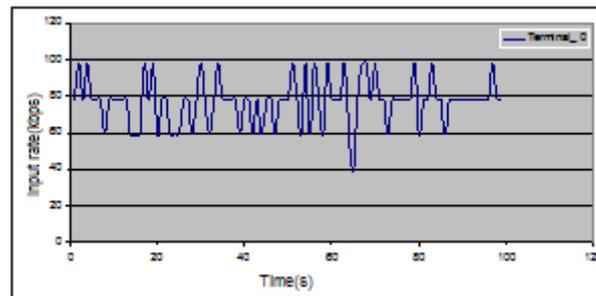


Figure 5 Traffic to the Input Terminal of the Variable Rate to Zero

The simulation parameters in Table 1 are adjusted so that a second request from the terminal at any time is sent to the hub.

Table 1 : Settings for Each Frame

The number of time slices	125
The length of each slot	250 bytes
The number of frames between two consecutive requests	4
Satellite broadband	1 mega bit

Formula (4) how to calculate the time each frame shows:

Satellite broadband = number of time slices per slot per frame \* \* 8 \* number of frames between two consecutive requests (4) .

**B. Evaluation of algorithms**

Naturally, the new algorithm in the context of simulations that will provide better performance than Pure RBDC RBDC algorithm is standard. The reason is that the history of the new algorithm maintains the traffic produced by the terminals, so the better the rate of allocation to the request. The algorithm is in Figure 6 see The proposed maximum relative delay in the moment, there are better shows.

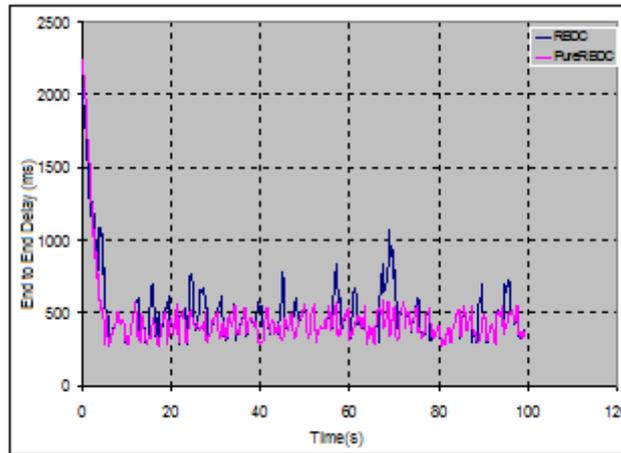


Figure 6: Comparison of two algorithms delay RBDC, Pure RBDC

Figure 6 is obtained from the analysis results are given in Table 2 and 3. Clearly, average delay of the new algorithm standard has fallen. The average percentage improvement of the proposed algorithm is compared to the standard more than 11 percent. Even in this moment of delay to improve the time it reaches 45 percent.

Table 2: Comparison of Results Delay Algorithms Pure RBDC, RBDC

	Pure RBCD	RBCD
The maximum delay	582 ms	1074 ms
Minimum del	273.5 ms	Minimum delay
The average delay	470 ms	The average delay

Table 3: Pure RBDC to Improve the Algorithm of Delay RBDC

The maximum percentage of delayed recovery Pure RBDC than RBDC	45.8%
Percent improvement in at least delay Pure RBDC than RBDC	0.03%
Average percent improvement in delay Pure RBDC than RBDC	11.06%

## VI. SUGGESTIONS

In later work, and subsequent articles can be compared to such methods RBDC, Pure RBDC traffic forecasting method can be thought . Tvrandr also available on line at the terminal of the other algorithms such as weighted algorithm ( $WF^2Q$ ) instead of the FIFO can be used [7].

## VII. REFERENCES

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