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**Proposal for  
Student Undergraduate  
Research Award (SURA)**



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## **Project Title**

# **Optimal Resource Utilisation In VSAT Networks**

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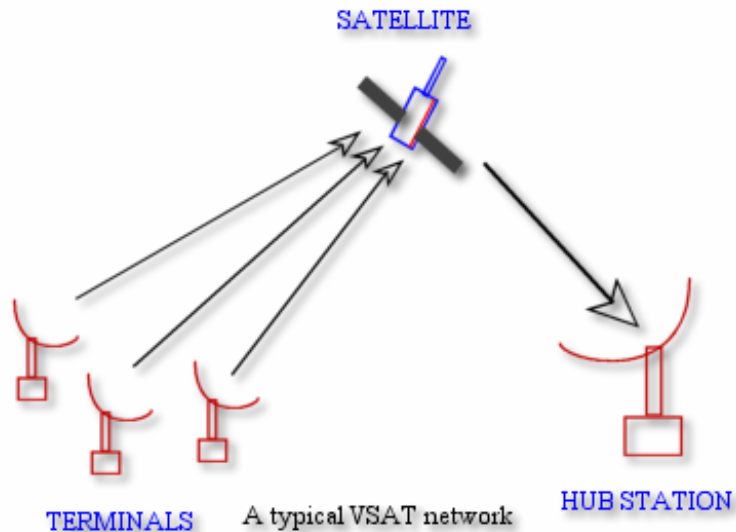
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## Objective

To investigate and analyse the various possible time-frequency allocation schemes and their hybrid models which can result in improved bandwidth utilisation and optimum use of bandwidth in VSAT networks for data services.



VSATs, very small aperture terminals, are small earth stations capable of receiving from, and sometimes transmitting to, satellites. They are an important part of the telecommunication world because they can provide a service directly to the user at virtually any geographic location covered by a suitable satellite beam.

## Motivation

With the increasing usage of satellite networks in computing environments, the issue of providing fair channel access among multiple contending hosts or packet flows over a scarce and shared wireless channel has come to the fore.

In a VSAT system consisting of a number of terminals that transmit traffic of any type on a shared medium to a centralised base station (HUB), a procedure must be invoked to access the channel and distribute data among all active users. This procedure to access the channel is known as medium access control (MAC) protocol. The resource sharing methods include dedicated assignment, random access, and demand-based assignment. In random access, slotted ALOHA scheme gained popularity due to its simple implementation and random access nature. **The maximum possible efficiency achieved by slotted ALOHA scheme is only 36%.** Dedicated channel schemes are appropriate for continuous traffic but can be wasteful for bursty traffic. Random access is suitable for bursty and comparatively low data traffic but is not desirable for delay sensitive traffic. A more

dynamic and optimal scheme is desirable which caters for various kinds of data services and results in higher bandwidth usage.

## Approach

The first step in the project would be SIMULATION of a VSAT network as for such a complex task , a mathematical closed form solution is very difficult to arrive at. A resource allocation multiple access problem would be simulated , and the traffic would be generated using Poisson distribution for bursty data. For FTP data, steady streams would be the adequate model. For telephone type of data silence and talk spurts would be accounted. The efficiency ( how much bandwidth is being used ) would be recorded. Then the random access and dedicated access schemes would be combined in a way similar to demand - based assignment. Depending on the inputs at a particular time , the allocation would be decided dynamically and TDMA , FDMA would be combined too. The efficiency of each scheme would be noted. Effort would be made to combine different standard schemes to surpass this limit. Also , what type of application needs what combination of schemes - this would be carefully studied.



Overall scheme for division of bandwidth. The bandwidth may be broken into frequency channels to which appropriate schemes may be assigned.