

## ViaSat LINKSTAR DHCP RELAY IMPLEMENTATION vs Local DHCP Server

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Mobile Universe, ViaSat's LinkStar integrates support for DHCP Relay to support dynamic and automatic IP address assignment at the RCST without the need for additional Customer Premise Equipment (CPE). This implementation can be used independently or integrated with additional features of LinkStar such as VLAN-tagging.

The DHCP Relay Agent feature allows to offer dynamic IP addressing and can be used with VLAN-tagging to automatically extend multiple VPN's to the same RCST while ensuring end-to-end traffic separation, IP address reuse, as well as automatic IP address provisioning. This can be combined with the LinkStar bandwidth management and IP QoS support to effectively extend terrestrial VPN's via Satellite seamlessly—without the need for any change to the existing terrestrial network schema. *Exhibit 1* depicts a practical example of a LinkStar VLAN implementation.

LinkStar uses a DHCP Relay Agent instead of the conventional DHCP Server in the terminal. This approach was chosen primarily since it is the industry standard approach and there are no current published RFCs to describe a DHCP Server that can support VLAN-Tagging. In addition, there are a key number of advantages that a DHCP Relay Agent offers versus a DHCP Server at the terminal. They are:

1. To minimize the use of resources of the RCST. A DHCP Server will require storing information to describe its scope of addresses to be used as well as the current leases for active DHCP Clients. Functionally, this will be a software process which will listen to DHCP requests and will serve addresses and maintain their leases until they expire. This functionality will require memory and flash in the RCST which for a large pool of addresses can be significant. To avoid this, most CPE devices will only offer a default set range typically a single Class C network or a set range of addresses, such as 100. Also, static DHCP entries will be reserved to a minimum again to conserve precious resources in the CPE. Using a DHCP Relay Agent by comparison, alleviates all of these constraints by allowing the requests to be forwarded to a full scale DHCP Server. This can be any DHCP Server and can be basically unlimited in resources.
2. Easy management. A Central DHCP Server will be easier to manage, monitor and control locally at the hub. It can offer both identical templates for identically configured terminals as well as customized configurations without sacrificing ease of use, performance or scalability.
3. Security. A Central DHCP Server can be integrated with an authentication mechanism and be able to track users that login and avoid serving unwarranted DHCP requests from potentially rogue PCs as well as track their usage.



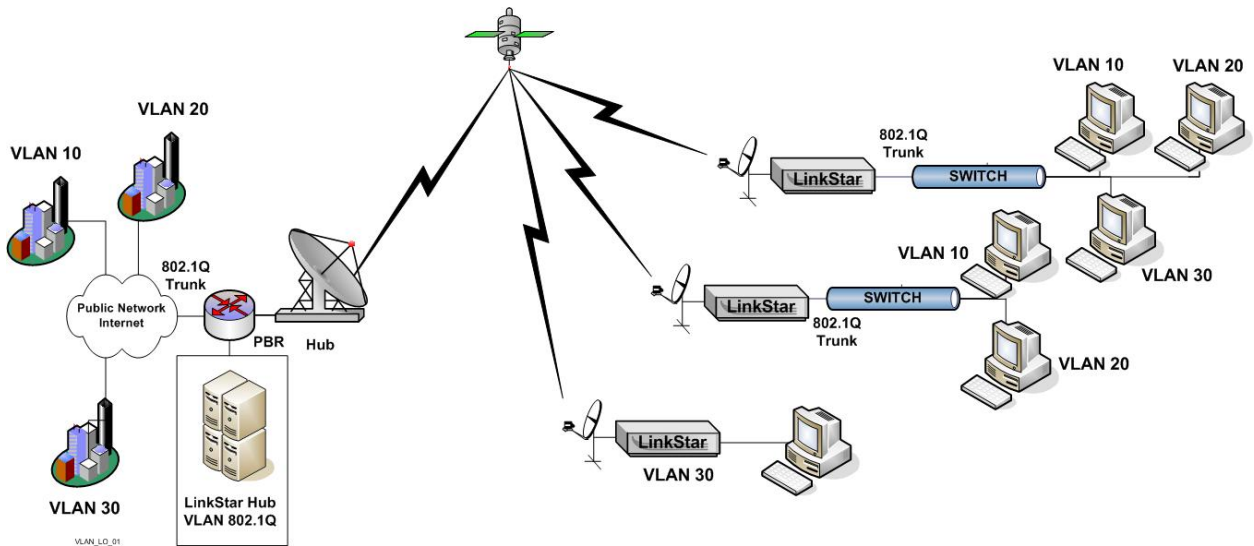
4. This implementation will offer also the capability to support multiple DHCP servers for multiple VLANs with different or the same IP addressing schemes available at the same RCST. This is equivalent to having multiple DHCP servers in the same RCST which can be limited if implemented locally at the RCST.

These are important advantages which qualify a DHCP Relay Agent as the preferred modus operandi for use in the LinkStar RCST for DHCP support. It also important to note that this is also the implementation used by both the cable modem and DSL industries.

While stating the above points, it is also important to note the constraints of using the DHCP Relay Agent Feature. Since, DHCP requests are forwarded to central DHCP Server at the hub, the satellite link is required for this feature to be functional. If the link is not available, any DHCP requests will timeout and will retry until the link is available to be honored.

To mitigate this effect, the lease time of a DHCP IP Address Lease is recommended to be have a long expiration time that is significantly longer than a potential outage. Should a PC receive an IP address and the RCST lose connectivity to the network, the PC will continue to have this address until the DHCP Lease expires. A typical lease expiration time should be 1 week. This will allow a powered on PC to have an IP address as long as it remains to be powered on. This practice is also common in the terrestrial broadband service industry.

Another point of mitigation is to increase the satellite availability to avoid unnecessary outages. If PC's are powered off for example on a nightly basis and powered on in the morning, it is important to ensure that all terminals are available and active in the network with high network availability. In this specific example for Mobile Universe, ViaSat recommends to increase the network availability of the remote terminals from the current calculated 96.4% to a recommended 99.5%. This significant increase in availability will reduce the probability that terminals are not available in the network during the initial power-on routine in the morning.



**Exhibit 1: Mobile Universe, LinkStar's VLAN Implementation**

In summary, the main advantages of using DHCP Relay vs. a full DHCP Server at the remote are

1. Robust Implementation with minimal terminal resource usage.
2. Easy Centralized network client configuration.
3. Security and control.
4. Support of multiple DHCP Scopes for multiple VLAN's in the same terminal
5. Industry standard practice with CPE for satellite and terrestrial services.
6. Availability can be mitigated with long lease expiration times and high network availability.