Radyne's SkyWire Gateway

Key Application
Radyne SkyWire and Vocality

White Paper

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Radyne Corporation • 3138 E. Elwood St. • Phoenix, AZ 85034 • (602) 437-9620 • Fax: (602) 437-4811

Adding IP routing capabilities to SkyWire using the Vocality V25 satellite router

Application

This white paper provides a technical overview of a system configuration achievable through a combination of hardware from both Radyne and Vocality. The configuration is an ideal solution for the transmission of voice, data, IP and ISDN services over satellite. Users of small to medium sized VSAT networks, such as tactical deployments or Satellite News Gathering truck operators, will see immediate benefit from the flexible nature of the system design, allowing easy to configure voice, data and clean feed audio to be transmitted either remote to remote, or from remote to the central hub site – with a migration path which will allow MPEG 4 video to be transmitted over IP alongside the communications router services.

Executive Summary

The Radyne SkyWire MDX420 is a satellite network product designed specifically for IP networks running over satellite. SkyWire is an extremely efficient, easy to use, low cost TDMA network platform purposely engineered for small to mid size networks which allows for true Full Mesh, Hub and Spoke, or Hybrid networks - all on one platform.

The Vocality V25 is a compact yet powerful Multiplexer and IP router which is optimized for the efficient transport of Voice and Data over bandwidth limited, high latency satellite links.

While the SkyWire system acts as an efficient layer 2 Ethernet bridge, it does not provide native support for IP routing or Voice traffic. The addition of a Vocality Router / Multiplexer enables full IP routing and TCP acceleration across the SkyWire network as well as providing for the efficient transport of analog voice. (STU is also supported when the optional Secure Voice Relay card is fitted.)

Typical applications

Figure 1 shows Vocality satellite routers providing a full portfolio of applications across a fully meshed SkyWire network

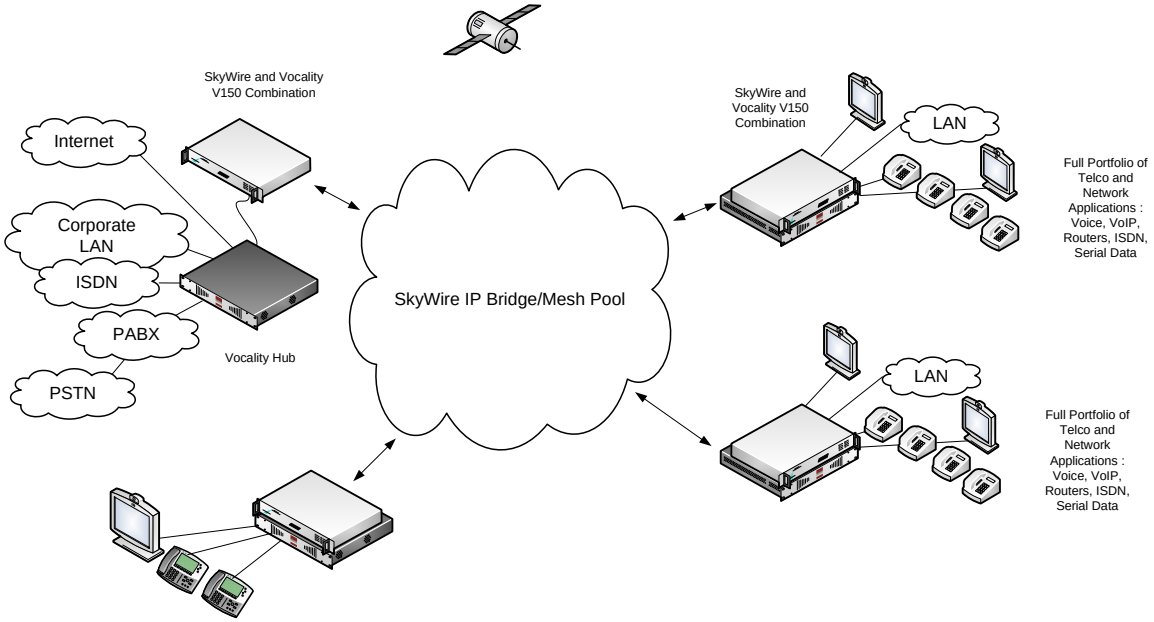


Figure 1.

Figure 2 shows a typical SNG application using Vocality satellite routers to separate and prioritize voice and data services.

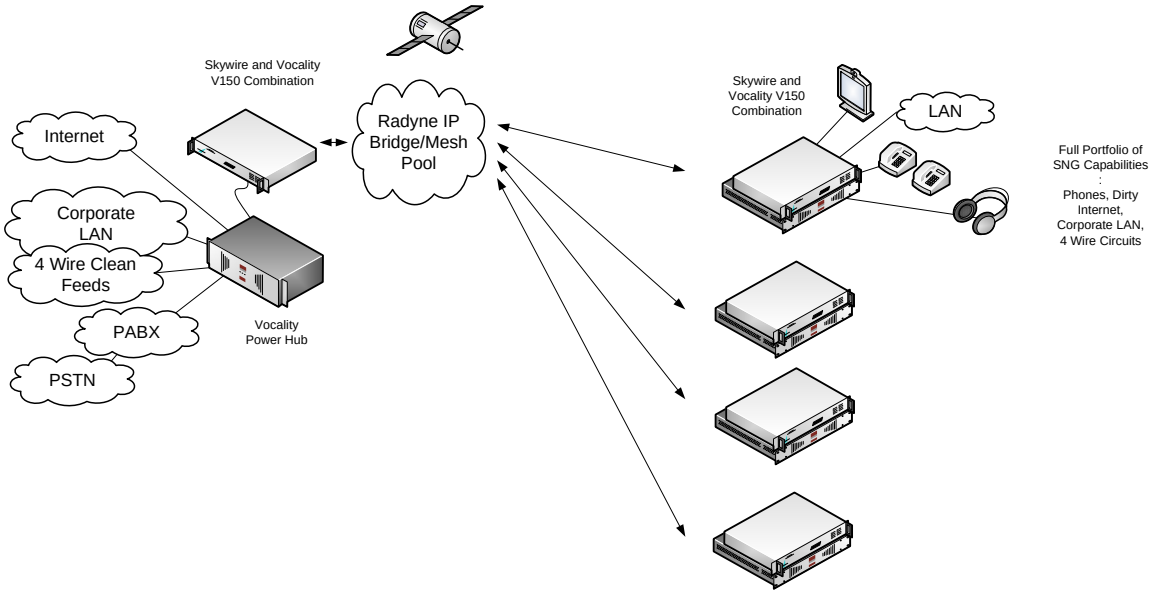


Figure 2.

Typical Configuration

An example configuration is shown in Figure 3. Three SkyWire MDX420's are set up in a fully meshed configuration running at a data rate of 3Mbps. A Vocality V25 is attached to data port J4 of each SkyWire gateway, while a separate Video transmission system is attached to data port J3 of gateways 1 and 2.

Each Vocality V25 is configured to have two IP aggregate links to each of its peers; one aggregate is used to carry voice traffic while the second is used for all other traffic, including IP. Both aggregates are carried over the same physical Ethernet link, but different TOS values are configured for each of them to enable the SkyWire MDX420 to differentiate voice and data traffic and thereby apply the correct QOS to each traffic type.

From an IP perspective SkyWire provides a bridged topology, so all Vocality V25 aggregate ports are configured with addresses in the same IP subnet. On the Tributary side, each V25 is configured with one analog telephone port (FXS), one 4 wire Tie-line circuit (Clean feed) and an Ethernet port. Both the analog telephone and tie-line ports provided compression using G.729A at 8Kbps.

The tributary Ethernet ports of each V25 are assigned to different IP subnets, allowing the V25 to provide IP routing between subnets over the SkyWire network.

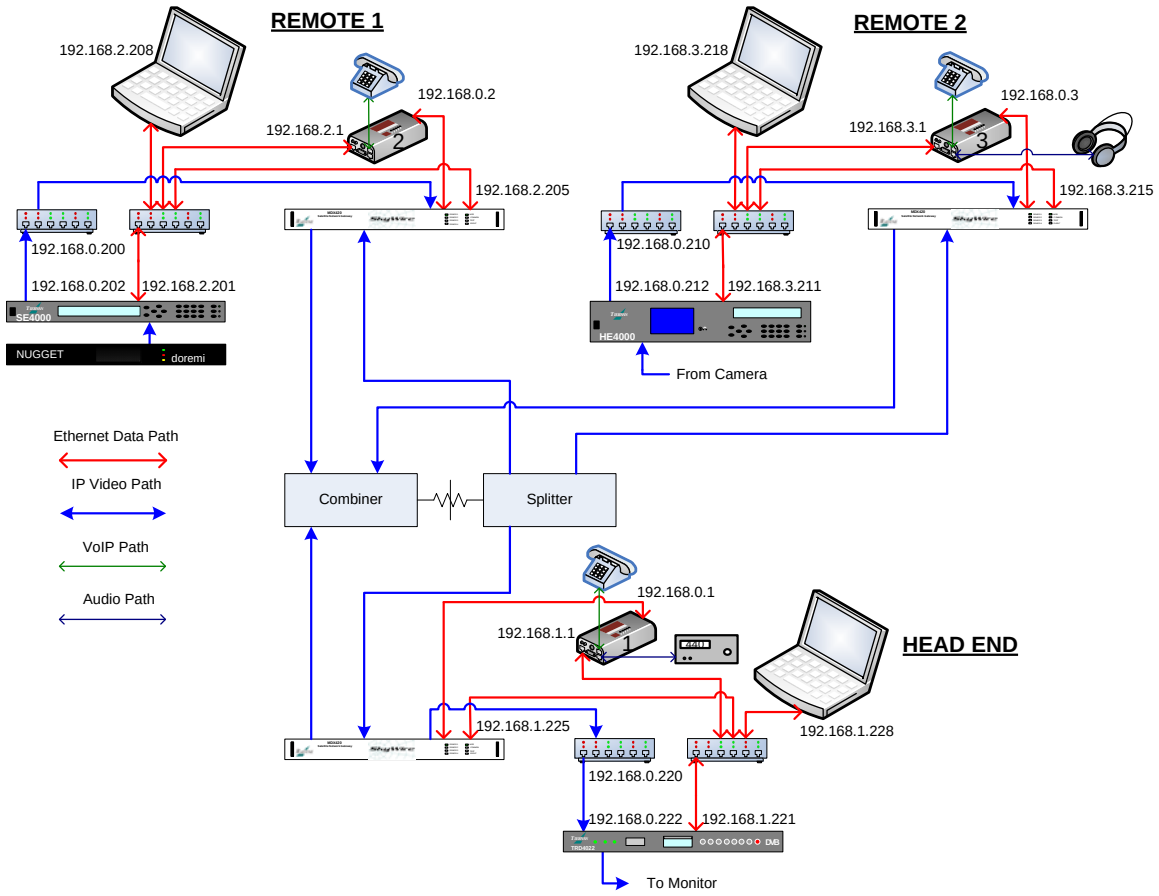


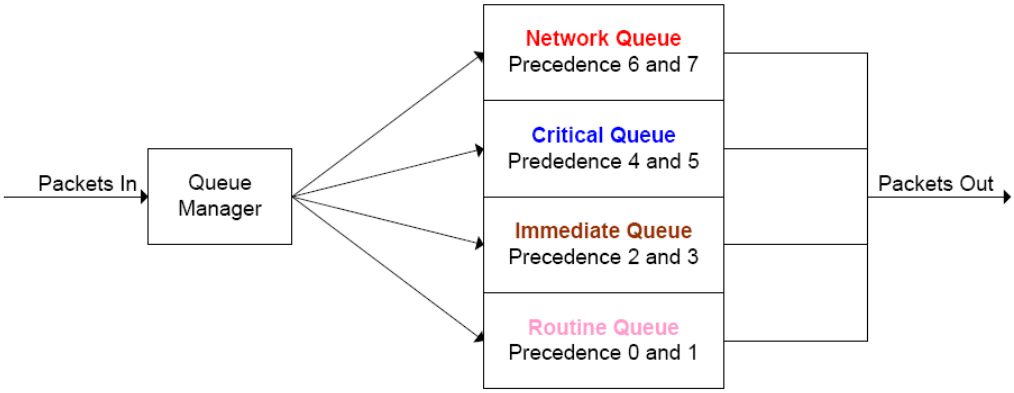
Figure 3.

Configuring the Equipment

SkyWire MDX420

Figure 4.

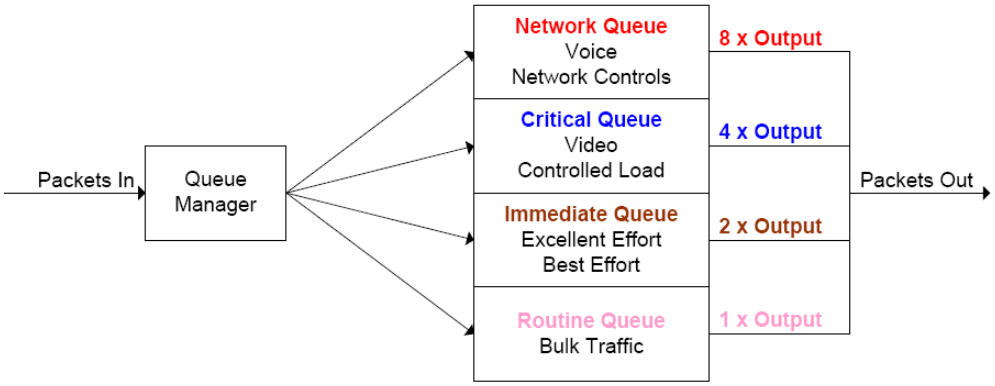
Figure 4 shows the rear panel of the SkyWire MDX420. No special setup is required other than ensuring that Ethernet data ports J3/J4 are set to use Normal QOS with Fair Weighted Queuing.



IPv4 Type of Service Traffic Flow

Figure 5.

Figure 5 shows how the MDX420 queues ingress traffic based on the Precedence value in the IP header. The Vocality V25 will set this value based on traffic type.



Fair Weighted Traffic Flow

Figure 6.

Once traffic has entered a queue, fair weighting queuing (Figure 6) allows higher priority traffic to move quickly through the system, while at the same time ensuring that lower priority traffic isn't stalled indefinitely.

Vocality V25

Tributary Ports: The Vocality Tributary ports for voice and data are configured as per normal practice. IP static routes were used for simplicity but RIP or OSPF protocols could equally be configured to provide automatic routing updates.

IP Aggregates: Two IP aggregate links need to be configured between each pair of Vocality nodes in order to provide separate paths for Voice and IP traffic. Ethernet port ENET1 on each V25 is given an IP address from the same subnet. Because multiple IP aggregates are configured on the same node, different UDP ports need to be specified. Finally TOS values are assigned to each link to enable the SkyWire MDX420 to identify the higher priority voice traffic.

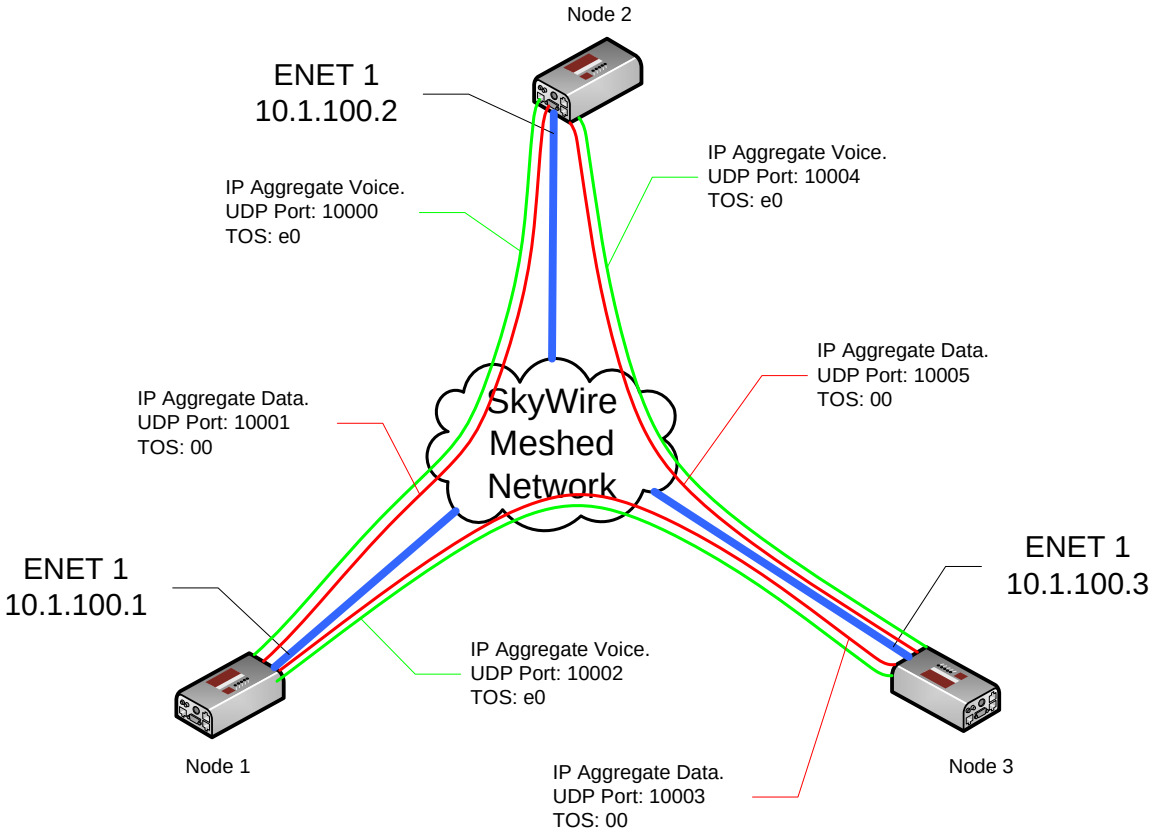


Figure 7.

Figure 7 shows how the Vocality V25's are routing Voice and Data traffic across two separate IP aggregates. Figure 7 shows the Vocality's V25 setting appropriate values in the TOS field of the IP header and routing Voice and Data traffic across two separate IP aggregates. This, in conjunction with the SkyWire MDX420 gateway's QoS capabilities ensures that the aggregate carrying the voice traffic is given priority.

Separating voice and data: Each port on the Vocality devices has a unique address consisting of Node / Slot / Port information. As the voice ports all have the same slot number we were able to setup the internal routing table to route voice traffic over one IP aggregate while all other traffic is passed over the second aggregate. Figures 8 and 9 show Screenshot of an IP aggregate used for voice traffic showing the TOS value, UDP port and destination IP address and the internal routing table from Node 1. In the Figure 9 screenshot, we can see that traffic to Node 2 Slot 1 (which is the voice card) will be sent over IP aggregate "tonode2v" while all other traffic to Node 2 will go over IP aggregate "tonode2ip".

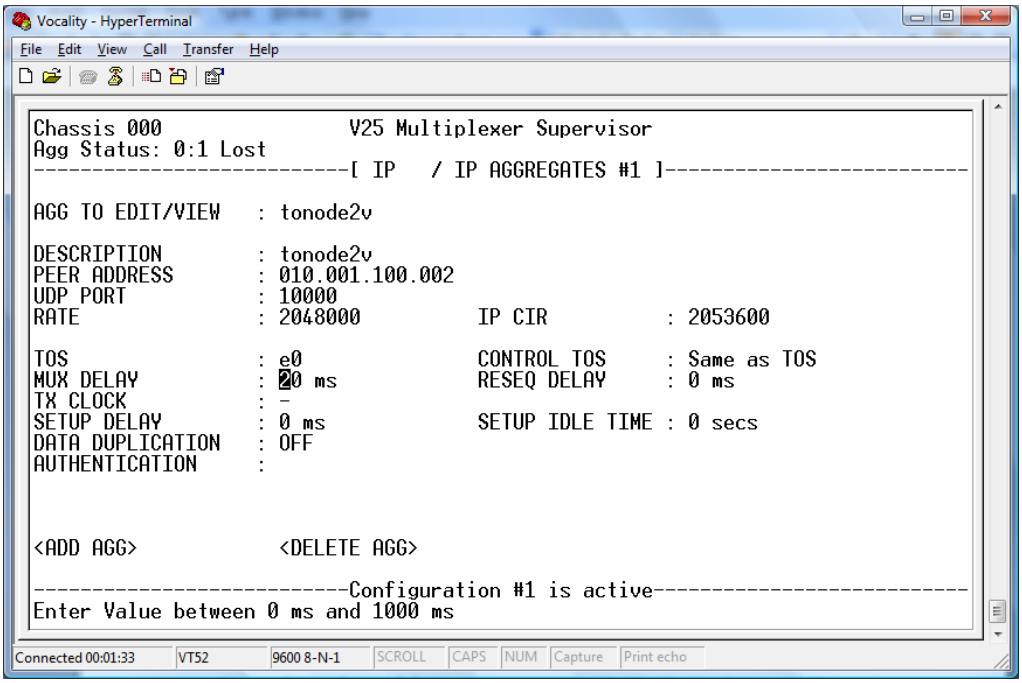


Figure 8.

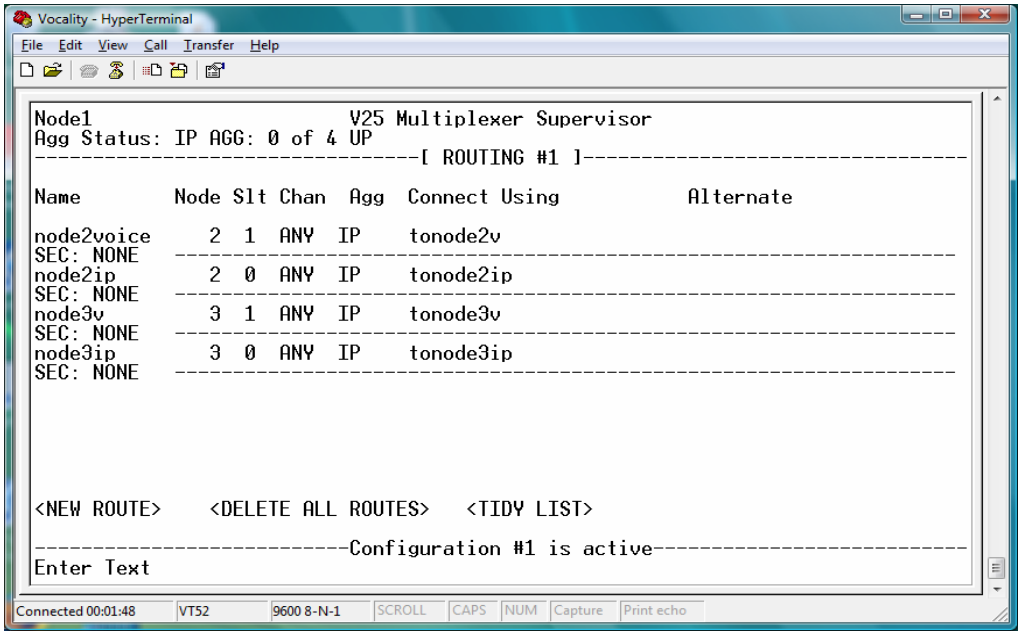


Figure 9.

Summary

This document has demonstrated the additional functionality which can be obtained by the addition of the Vocality satellite routers to an existing SkyWire network. Providing IP routing functionality and support for analog voice, while at the same time allowing traffic types to be identified and correctly prioritized, will be of tremendous benefit to satellite users and is particularly well suited to the needs of the DSNG community.

Further expansion

This whitepaper has focused on the SkyWire MDX420 with the Vocality V25 which is the smallest product in the current Vocality range. Substitution of one of the larger Vocality satellite routers such as the V50+, V150 or V200 would provide greater capacity in terms of the number of analog voice and Ethernet ports and could also enable the transport of digital voice allowing terrestrial PBX systems and ISDN networks to be extended across the SkyWire domain.

The prioritization scheme described in this document could be further expanded to allow the separation and prioritization of encoded video streams in addition to Voice and IP by the addition of a third IP aggregate and selection of suitable TOS values for each of the three streams. The high throughput and embedded QOS capabilities of the SkyWire MDX420 gateway combined with the larger Vocality satellite routers provide a complete portfolio product offering for the enterprise and broadcast markets.

Finally, all the Vocality satellite routers provide support for serial data streams over IP thus enabling legacy serial applications to be carried over SkyWire and providing a smooth migration path towards newer technologies.

For more information, contact:

Radyne Corporation
3138 E Ellwood St
Phoenix, AZ 85034
USA
602-437-9620
sales@radn.com

Vocality International Ltd
Lydling Barn
Puttenham Lane
Shackleford
Surrey GU8 6AP
United Kingdom
sales@vocality.com