



**BreezeACCESS VL™ &  
BreezeNET B™**

**Voice over IP Support**

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# Scope

The purpose of this document is to describe the flow of Voice over IP traffic in BreezeACCESS VL and BreezeNET B. A description of different voice over IP traffic is also provided, followed by an explanation on how to optimize system performance with voice traffic, through voice generation equipment configuration and system configuration.

## Introduction

Voice over IP traffic is considered by BreezeACCESS VL/BreezeNET B as high priority traffic only if it is marked as such. The priority marking of traffic is done by two means<sup>1</sup>:

1. Applicable when sending IP traffic via the system - setting the precedence field in the IP header of a packet to a value higher than 3. System default IP ToS threshold is 3. The user may configure a different threshold in each unit.
2. Applicable when sending VLAN tagged packets via the system - setting the priority field to a value higher than 4. System default VLAN priority threshold is 4. The user may configure a different threshold in each unit.

Voice over IP traffic varies in its rate and packet size as a function of two parameters:

- The used coding standard.
- The "packet size".
- Voice activation detection

As BreezeACCESS VL/BreezeNET B are "packet switched - 802.11" based systems, their capacity is a function of the conveyed packet size. Therefore, when using shorter packets more frequently the overall capacity decreases.

In order to achieve maximum throughput using the system, the following is essential:

- Keep the frequency of packets occurrence as low as possible.
- Keep transmitting long packets.

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<sup>1</sup> More on prioritizing traffic refer to ***Understanding Priority Functionality.pdf*** on the Alvarion Web site, Customer Service > Product Support > Manuals and Technical Notes

# Generating Voice over IP

## General

The generation of voice over IP traffic consists of two main phases. The first phase is to convert the analog voice signal to digital form (sampling and coding phase). The second phase is generating IP packets that encapsulate the voice samples.

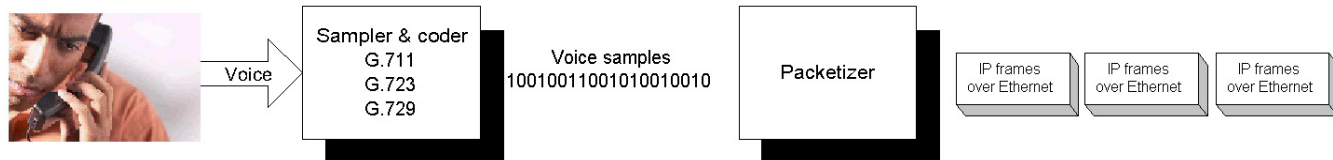


Figure 1: Voice over IP Packet Generation

## Sampling & Coding

A sampling and coding machine converts analog voice into bundles of digital data (1s and 0s). The difference between coding standards lies in the frequency in which a bundle is released from the coding machine and in its size.

Three prominent coding standards appear in figure 2. The "bundle" size and the frequency of the bundle release is mentioned for each of the coding standards for a single direction voice flow.

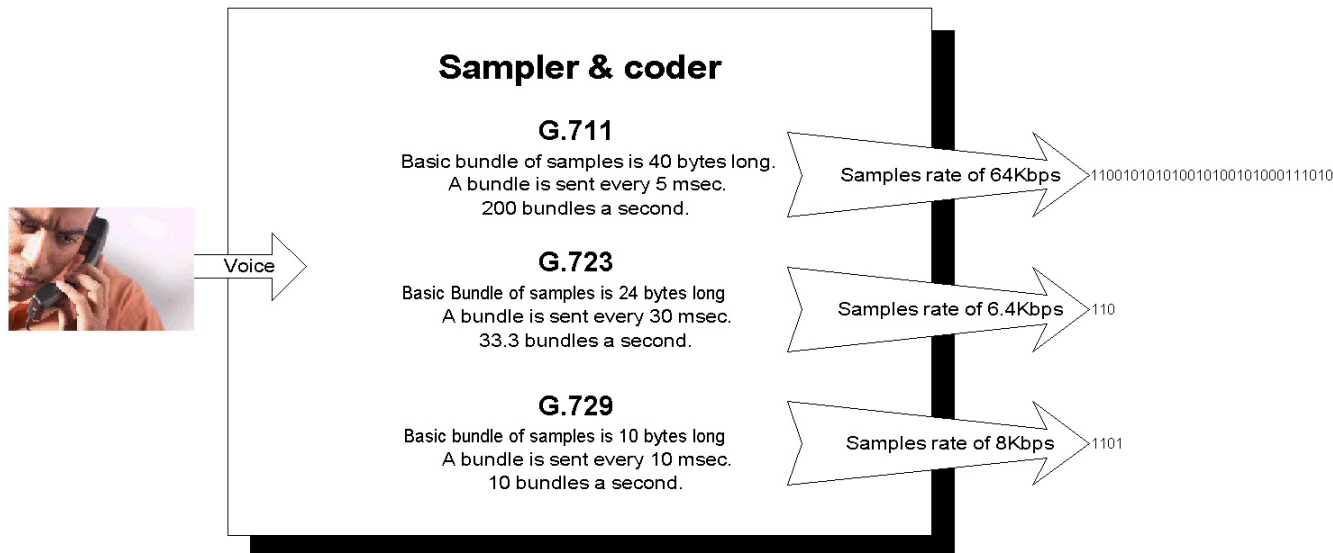


Figure 2: Coding Standards Data

## Generating IP Packets

The size of the voice over IP packets and their frequency is a function of the coding standard (giving out the sample bundles) and the "packet size". The "packet size" is the time between each release of a voice over IP packets. An Ethernet packet encapsulating the IP packet is comprised of the number of bundles that fit in the "packet size" plus a header of 58 bytes. For example if a G.729 coding standard is used with a "packet size" of 30msec the packet size that will be created will be of 88 bytes, (three bundles of 30 bytes plus a header of 58 bytes) and it will be sent 33.3 times a second.

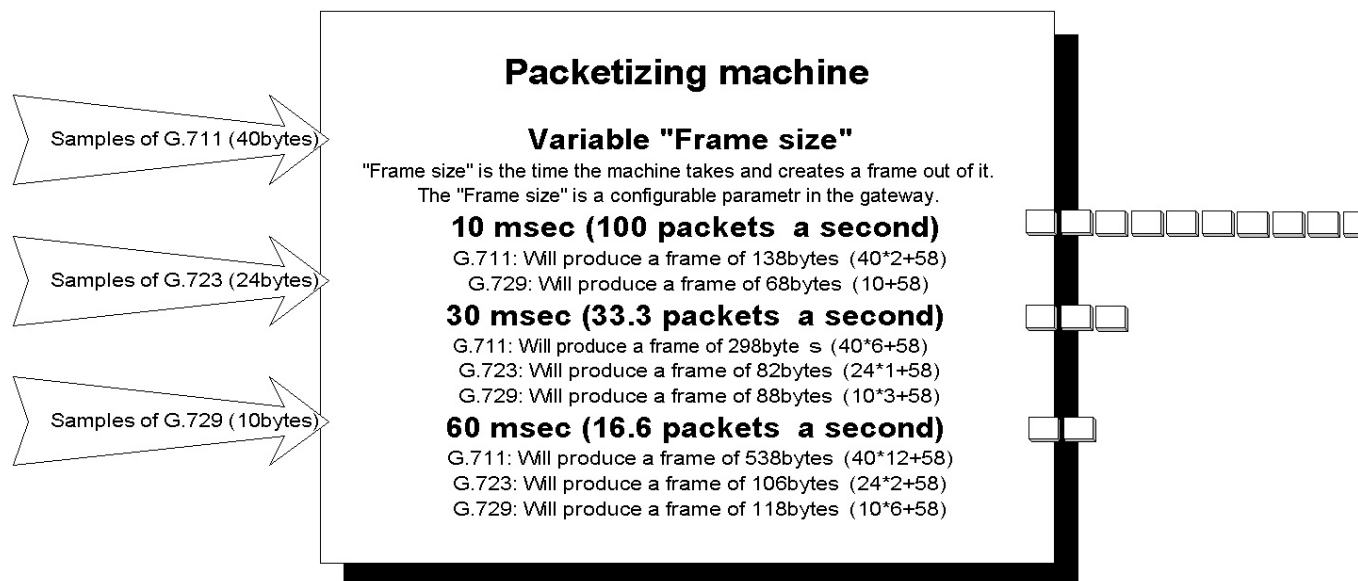


Figure 3: Three "Packet Size" Examples

## Optimal Configuration

An optimal configuration of a voice over IP generating device would include the following:

- "Efficient" coding standard (G.729 or G.723).
- Largest "packet size" available in the equipment (usually 60 msec).
- VAD – enabling voice activation detection insures that no packets are sent in "silence times".



### IMPORTANT

The "packet size" is a much more prominent parameter than the coding standard as it affects packet generation rate.

# BreezeACCESS VL and BreezeNET B Support

## General

As the BreezeACCESS VL and BreezeNET B are packet switched 802.11a-based systems, their throughput varies as a function of packet rate and size. This is a result of the air protocol overhead.

The systems employ two features that enhance their throughput capability: Concatenation (will be available in version 3) and Burst mode (available in 5.8 GHz – Non UK & 5.2 GHz band). Therefore, enabling these two features will enhance the systems throughput capabilities.

Another factor that impedes BreezeACCESS VL throughput is the cell distance. This parameter is intended at insuring fairness of traffic availability to all the SU in the sectors. Maintaining the distance as high as the furthest SU and changing the fairness factor is the correct procedure of increasing the cell's throughput while maintaining availability.



### IMPORTANT

BreezeNET B is not affected by the link distance parameter and should be set at 0 Km – no compensation.

The nature of the 802.11a protocol is such that the packets per second that can be conveyed on it is influenced by the following:

- **The packets per second that a unit can process.** The limitation of version 2 is for about 3000 Packets per second. Version 3 handles 5000 packets per second.
- **The modulation on which the air-packet is sent:**

Version 2 - in the lowest modulation (6 Mbps) the air utilization (throughput) reaches around 85% (more than 5 Mbps UDP traffic) of the modulation speed, whilst in the highest modulation it reaches around 55% (30 Mbps UDP traffic).

Version 3 - in the lowest modulation (6 Mbps) the air utilization (throughput) reaches around 90% (over 5.5 Mbps of UDP traffic) of the modulation speed, whilst in the highest modulation it reaches around 70% (around 40 Mbps UDP traffic)

The following graph depicts the system performance as a function of packet size. The graph refers to version 2 with no concatenation:

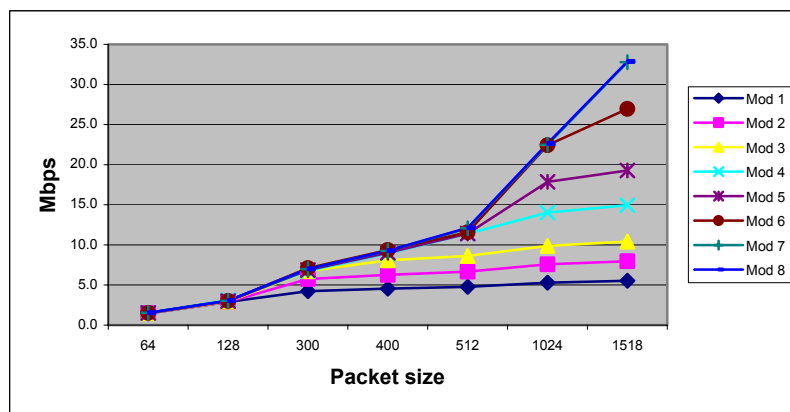


Figure 4: Throughput as a Function of Packet Size – Version 2

## System Configuration

In order to increase system throughput, the following should be set in the system:

- *Max cell distance* parameter should be set according to the maximal distance of the furthest SU. Change Fairness factor parameter should be set to a minimal number 25 to achieve connectivity (Increasing overall cell performances on the expenses of fairness and degrading throughput of remote SUs). For full fairness, factor should be set to 100.
- Enable burst mode if possible.
- Enable concatenation (version 3 and up).
- Set the IP ToS threshold and VLAN threshold at the correct value to ensure that voice packets are set at the High queue.

## Test Results

The following table summarizes the lab test results obtained when working on the following setup:

- Five BreezeACCESS VL were associated with an AU and the voice sessions were equally divided among the SUs
- No traffic except the voice sessions ran over the system.
- The used CODEC is specified along with the packetizing time.
- VAD (voice activation detection).

As these are lab results, they should comply with a deployed system if the system is working in an interference free environment.

**Table 1: BreezeACCESS VL - Active Voice Calls per CODEC**

CODEC	G.729	G.729	G.729	G.729	G.711	G.711	G.711
Packing time	20ms	40ms	60ms	60ms	20ms	60ms	60ms
VAD	OFF	OFF	OFF	50%	OFF	OFF	50%
Max # of calls	30	60	90	120	30	70	85

## Conclusion

As the use of VOIP is growing worldwide, VOIP tests in BreezeACCESS VL show very promising results (as described in Table 1 above).