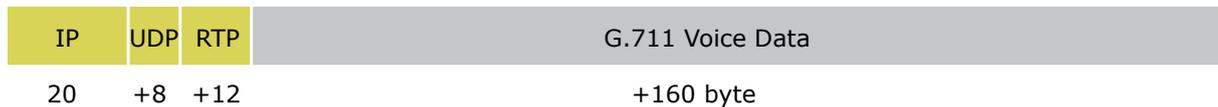# IP Telephony and ADSL
SmartShare

The most used CODEC for IP Telephony is called G.711, and the sound is sent using RTP packets. An RTP packet contains 20 ms of sound, so 50 RTP packets are sent each second. (50 * 20 ms = 1 second.)

The size of each RTP packet is: 20 byte IP header + 8 byte UDP header + 12 byte RTP header + 160 byte G.711 data = 200 byte total.

RTP Packet (20 ms, G.711 CODEC): 200 byte

IP	UDP	RTP	G.711 Voice Data
20	+8	+12	+160 byte

50 RTP packets per second with 200 byte per RTP packet becomes 50 * 200 byte per second = 10000 byte per second. With 8 bit/byte, it becomes 80 kbit/s. This number, 80 kbit/s, is familiar to many people working with IP telephony.

ADSL connections have some extra ovherhead, because the IP packets can't be sent directly on the ADSL connection, but must be encapsulated into ATM cells, which contain 48 byte each. Each ATM cell has a small header of 5 byte in front of the 48 byte data, and thus takes up 5+48 = 53 byte.
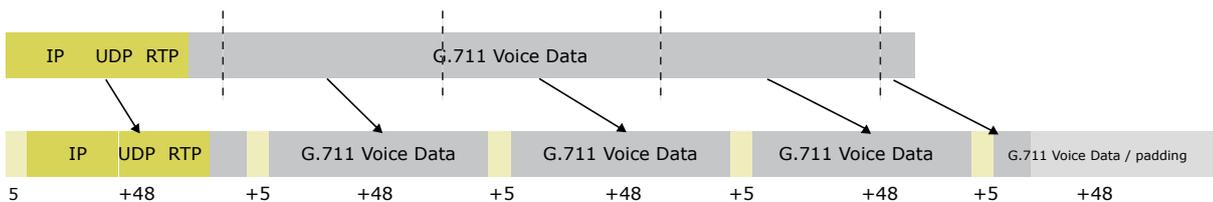
ATM Cell: 53 byte

H	Payload
5	+48 byte

Only complete ATM cells can be transmitted, so an RTP packet of 200 byte is put into 5 ATM cells. (200/48 = 4.17)

On an ADSL connection, an RTP packet thus takes up 5 ATM cells of 53 byte = 5*53 byte = 265 byte.

ATM Encapsulation of RTP Packet: 200 byte ⟶ 265 byte

IP	UDP	RTP	G.711 Voice Data

	IP	UDP	RTP		G.711 Voice Data		G.711 Voice Data		G.711 Voice Data		G.711 Voice Data / padding
5			+48	+5	+48	+5	+48	+5	+48	+5	+48

50 RTP packets per second with 265 byte per RTP packet becomes 50 * 265 byte per second = 13250 byte per second. With 8 bit/byte, it becomes 106 kbit/s.

In reality, an ADSL connection of 512 kbit/s has the capacity for 4 concurrent IP telephone conversations (512/106 = 4.8), not 6 (512/80 = 6.4), which you would otherwise think.

It is worth noting that ADSL2, ADSL2+ and VDSL connections also use ATM encapsulation, but VDSL2 connections typically do not.

A quick tip: When setting the connection bandwidth for an ADSL connection on a SmartShare, a correctly set Connection Type means that the ATM encapsulation overhead is taken into account, and the connection is not overloaded, but can be used optimally.

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