
COST OF UPGRADES FROM OUTSIDE FUNDS (SB2-19)

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INTRODUCTION

Cost of bandwidth from outside sources is based on three elements: cost of the space segment, efficiency of coding/modulation and overhead costs.

After the Istanbul meeting, it was found necessary to cut back the modulation from 16QAM to 8PSK (with a smaller FEC) to improve the signal to noise ratio and the operating stability in the direction from the hub to the remotes. This is partially offset by a correction in the formula for the return channel. The resulting changes are indicated below.

EFFICIENCY OF CODING/MODULATION

The general relationship between Hertz and bits per second is given by

$$\text{Hertz/BitsPerSecond} = (1/\text{BitsPerCell}) * (1/\text{ForwardErrorCorrection}) * (\text{ReedSolomonFactor}) * (\text{RolloffFactor})$$

In the direction from the hub to the remotes, the use of 3 bits per cell (8PSK), a forward error correction (FEC) of 8/9, a roll-off factor of 1.25 (side bands to -23 dB), and a Reed-Solomon factor of 204/188 consumes 0.509 Hertz per bit, compared to 0.452 for 16QAM.

In the direction from the remotes to the hub, the use of 2 bits per cell (QPSK), a forward error correction (FEC=7/8), a roll-off factor of 1.4, and no Reed-Solomon consumes 0.8 Hertz per bit.

OVERHEAD COST

For overheads, 20% will be added to the raw cost.

TOTAL COST

In the direction from the hub to the remotes this results in a cost of \$24,415 per Mbps and year (versus \$22,755), in the direction from the remotes to the hub the cost is \$38,400 per Mbps per year (versus \$40,265).

For a video conference channel with 1 Mbps outbound and 1 Mbps return, this corresponds to \$62,815 (versus \$63,000) per year, while for Internet access with (assuming a typical rate of 3:1) 1 Mbps outbound and 333 Kbps return the cost is \$37,215 (versus \$36,200) per year.