

# Speed of Light, VoIP and Satellites

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Customer reports that the round trip echo time for a VoIP connection over a satellite link is 3 seconds. This is the time from when the users speaks to when the user hears their own voice coming back as an echo.

## How much of this latency is caused by distance?

The ground station to satellite distance is 22500 km. We assume that the distance from the satellite to the far end receiver is the same. There is the up hop, and then the down hop. For an echo to come back, then this distance is travelled 4 times.

$$\text{Total air distance} = 4 * 22500 \text{ km} = 90000 \text{ km}$$

$$\text{Speed of Light} = 299792 \text{ km/s}$$

From this we can work out the time the echo spends flying through the air

$$\frac{90000}{299792} = 0.300 \text{ s}$$

## Conclusion

The 3 second echo time is not caused significantly by the air fly time.