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Satellite Internet 101: Straight Talk From an Industry Veteran

by Rick Hodgkinson, President & CEO of Galaxy Broadband, 30 years experience in the satelite industry

C Band? Ku Band? Ka Band? Where is the sense in all of this?

Though I'm not an engineer, I am an entrepreneur with a strong technical background. I have been involved with the satellite industry since 1981 and have personally installed thousands of C Band and Ku Band systems. As the C.E.O. of one of the largest commercial-grade satellite internet networks in North America, GALAXY® Broadband Communications Inc., I would like to share some insight regarding our innovative technology.

If you use a C Band satellite as your link to the outside world, then GALAXY® Broadband can save you money with our Ku or Ka Band "QoS" (Quality of Service) enterprise service. Today's internet protocols require a two-way connection. TCP cannot send data packets unless it receives acknowledgement that the data has arrived at the destination address. Therefore, you cannot rely on a "receive only" configuration like a satellite TV dish does; you must also send packets of data to the satellite itself. This is no simple task since the satellite is located 23,500 miles out in space.

So what are the key factors for successful delivery of packets to the satellite? Accurate pointing and the right dish size for your location on Earth are imperative for successful delivery. In technical terms, this is called a link budget. This is not exactly like the budget term business people are used to but similar. Think of the link as a path from your dish to the satellite. The path is narrow and straight like a laser beam and your dish must focus its beam precisely on the same path. You "make budget" if you stay on the beam with the right pointing and focused power. Any deviation and the packets are literally lost in space. Furthermore, if you make your budget then you will successfully send and receive packets at your projected speeds as long as your provider hasn't "oversold" the available space on the network.

If your satellite internet provider has "oversold" their network, then your speeds may suffer from "congestion." The best analogy I have used over the years to describe

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"congestion" is traffic on a highway. Speeds will slow down if you simply have too many cars for the available space on the highway. It's a similar path to the satellite since the more packets competing for the same space, the slower everyone will travel. Service providers oversell their available space on the network since operating at a maximum capacity will assist in achieving maximum profits. Hence, the label "best effort" or "up to speeds" since it is virtually impossible for a network operator to achieve perfect utilization.

Though all consumer class services are "best effort," GALAXY® Broadband provides a Ku or Ka Band "QoS" (Quality of Service) enterprise service that offers data prioritization and guaranteed access to space assuring more consistent speeds and lower latency. If your business relies on satellite communications for voice and data, you will need an enterprise class service provider and not simply more speed. You could have all the speed in the world, but if your applications don't work or if your voice sounds garbled, you won't be pleased and your business will ultimately suffer.

There are three types of satellite frequency bands used today: C Band (4 – 6 GHz), Ku (11 – 14 GHz) and Ka (18 – 30 GHz). Think of them as AM, FM, or Shortwave radio. You need different equipment for each frequency and they are not interchangeable. Satellites in space transmit and receive in these frequency bands and each has a unique capability. C Band is low frequency, low power and travels everywhere. C Band signals from North American satellites cover the entire continent. It is the tried and true technology, but you need an enormous dish (3.8M) because the signal is weak. On the other hand, Ku Band allows you to use a much smaller dish (1.2M) because it has a more powerful signal but its coverage area is smaller. Lastly, KA Band offers the smallest dish of the three because it has the most powerful signal of all but also the smallest beam size.

All satellites use power from solar panels. The source power available for sending and receiving signals from the Earth is about the same, but the targeted coverage area determines the best frequency to use in order to deliver the optimum signal power. Satellite operators that want to offer ubiquitous coverage for North America will use a wide beam (C Band) but the resulting power is low. If the provider wanted to give service to the state of Kansas for example, it would be in a focused beam allowing the use of a smaller dish (Ka Band). Thus, the frequency selected is ultimately determined by who the customers will be.

C Band's unique advantage is that it continues to work under most weather conditions. It has a long wavelength so it is not easily attenuated by rain. Ku and Ka Band can be affected by weather, Ka slightly more than Ku because the wavelength is close to the size of a raindrop. The technical term the industry uses to rate the weather impact is called "availability." "Availability" is quoted in percentages, so the best possible 100 percent translates to the satellite link as always working and there is zero atmospheric loss or

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attenuation. An availability of 99.9 percent means that .1 percent of the time signal is lost and the satellite link is broken. So if there are 365 days per year multiplied by 24 hours multiplied by 60 minutes = 525,600 minutes, then .1 percent downtime equals 525 minutes or 8.7 hours in a year. Clearly, if you have a site in the desert your availability is higher than if you live in the tropics. Typical Ka Band availability in Canada is 99.8 percent, so the downtime is likely to be about 17.5 hours per year. Considering most operations sleep for 8 or more hours a day, then 9.5 hours per year is a reasonable expectation of downtime due to weather.

For an existing customer, C Band should be used for your minimum needs of bandwidth. For example, if you absolutely need 4 phone lines and some email to work in all weather, then you must keep a minimum of 256kbps active on your C Band link. With GALAXY® Broadband's Ku or Ka Band "QoS" enterprise service, you can have a backup link on a completely different technology, while saving money by using up less expensive bits of data.

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