

The Truth about Internet Service in the Middle East

By Brian B Donaldson



Users making adjustments to their Satellite Internet Dishes. TV dish to the far left. FOB Salerno, Afghanistan.

Internet Service in the United States, Europe, and most of the developed world has evolved to a well defined operation. But in third world countries, it is still a mystery and the infrastructure does not exist to support many users. That is why satellite is still the primary means of accessing the internet in these areas, to include rural parts of the developed nations. What I hope to accomplish here is to educate the reader in the truth about satellite internet service in areas that do not have reliable infrastructure for internet, mainly in Afghanistan. However, this paper may apply anywhere in the Middle East as most satellites in this region will service these countries. A lot of soldiers, airmen, sailors, and Marines are heading here, or are already here in remote areas. They are my target audience of this paper.

What not to expect

As with any service one has available to them in developed regions like the United States, Europe, Down Under and parts of Asia, one has a certain expectation that service will be reliable and dependable. Welcome to the Third World. What you can expect here is unreliable and undependable service. A key to success here is to keep one's expectation at a minimum.

kbps or kBps

When looking for internet service, one will no doubt contact a company that provides the best service for the most reasonable cost. I will not list any of the companies available because that would single them out above others. One can search the internet for service providers in this region and get a host of companies and articles recommend certain companies. I wish to treat the information as more important than an actual service provider.

When looking at their brochure one will see all the different data rates available. One of the most reasonable rates is 128/64. This indicates the down-stream data rate and the up-stream data rate. The first number, 128, can either be in kilo bits per second (kbps) or kilo bytes per second (kBps). Nominally the value is kbps. But isn't kBps better than kbps? Let's examine the relationship between the two.

First I need to define what a "bit" is. An internet search on bits and bytes will reveal that a bit is comprised of either a zero (0) or a one (1). This is an off-state, 0, or an on-state, 1. That is it. So if you see a number like 128 kbps that relates to 128,000 zeros and/or ones being transmitted. More on this later.

Now, a "byte" is a little different. A byte is comprised of eight bits. Bytes are usually reserved for file sizes, not data transfer. So a byte will be smaller in numeric value only. When we talk about 1kb, we are actually saying 1024 bits, not 1000 bits. When we talk about 1MB (or 1,000,000 bytes) that would be 8,388,608 bits. This is confusing, I know, but it will get simpler as we continue because we will be dealing mostly in data transfer rates.

Some providers do not distinguish if they are referring to bits or bytes. They may show the data rates as xxxKBPS with everything capitalized. One will have to ask the transfer rate is kilo bits or kilo bytes. Nominally, all transfer rates are in kbps. Here is a list of some simple relationships comparing the two (kbps = kBps):

128kbps = 16kBps 256kbps = 32kBps 512kbps = 64kBps 1024kbps = 128kBps

This relationship will help you determine what transfer rate you need. Most applications when denoting the download speed will give you a value in kBps. As you can see with a 128kbps downstream rate one should not expect to achieve more than a 16kBps download rate. To give you an idea of what to expect time wise in the transfer rate, here is a list of times for a 10MB file transferred at the standard data transfer rate (all times are approximate and rounded):

128kbps = 11 minutes 256kbps = 5 minutes 512kbps = 3 minutes

One thing to keep in mind, there are means of increasing the perceived speed by using different coding methods or by the use of accelerators. Also, transfer rates could be much slower than the theoretical values as will be explained later.

So, as you can see, if I use the term "128kbps" or "128000 bps", those are big impressive number. But if you take that 128,000 and divide by 8, (128,000/8) you will get 16kBps, or 16,000 Bytes per second. That is not a very impressive number, isn't it? So marketing demands that the larger number is more impressive. 128kbps versus 16kBps (I would get the higher one even though they are both the same).

The lesson here is to understand the terminology used to dictate data rates, and to know what you want in the way of download rates. Be aware that some providers will limit what you can download or stream. That is called the Quality of Service and if you exceed your allotment you can be penalized or the provider can charge you an extra fee. One provider that I investigated sets a daily limit of how much one can download off the satellite.

Latency

Here is one of the biggest excuses when internet service providers tell you why your data is so slow. First and foremost they will claim it is your computer. Ever call an Internet Service Provider for service and the first thing they tell you it is your computer? Could not possibly be their system. So as a precaution, always check your computer against someone else who is using the same system and compare.

Latency is the time it takes for a signal to get from point A to point B and back again. Now some will state that the distance your data has to travel has everything to do with latency. I have seen signage stating the data has to travel a distance of 90,000 miles and that is why it will be slow. This got me to thinking how they came up with this number.

In satellite communications, we deal with a space borne object that is “parked” in orbit over the equator. This object moves in synchronization with the earth for a 24 hour period, thus appearing to remain stationary. The distance above the equator is approximately 35,799 kilometers at its closest point to 41,649 kilometers at its furthest points, quite a bit of distance I would say. (In miles that would be 22,231 to 25,752). So I can see why someone would use 90,000 miles because that would be true in the follow scenario: earth to satellite, satellite to earth, and then back again.

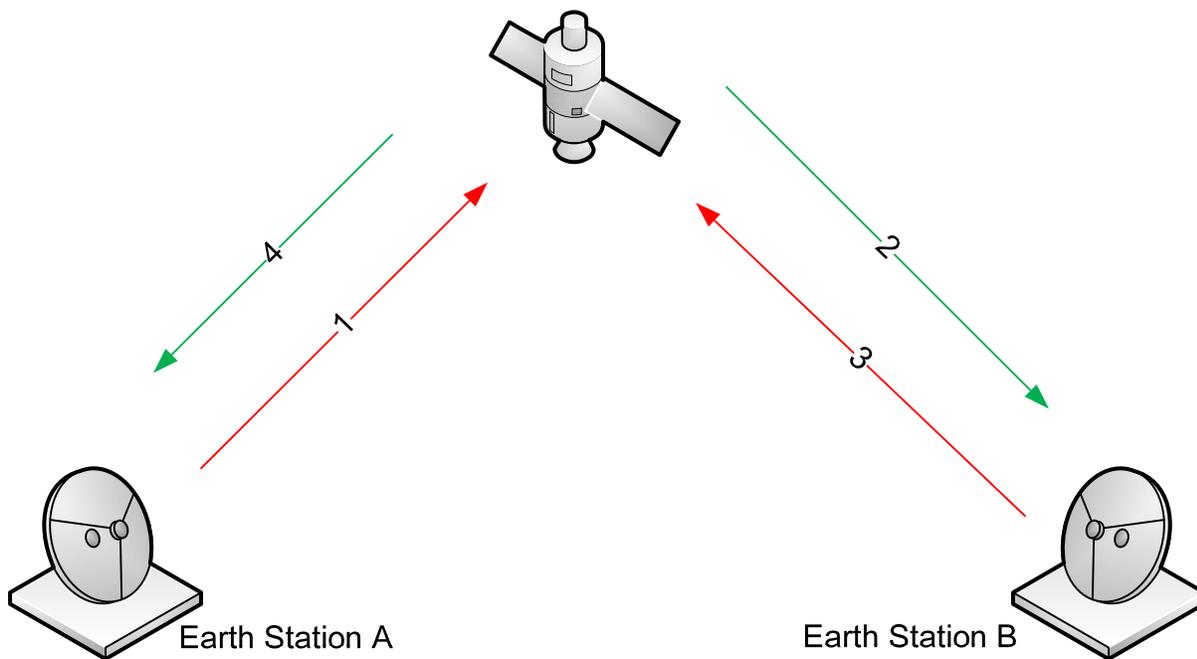


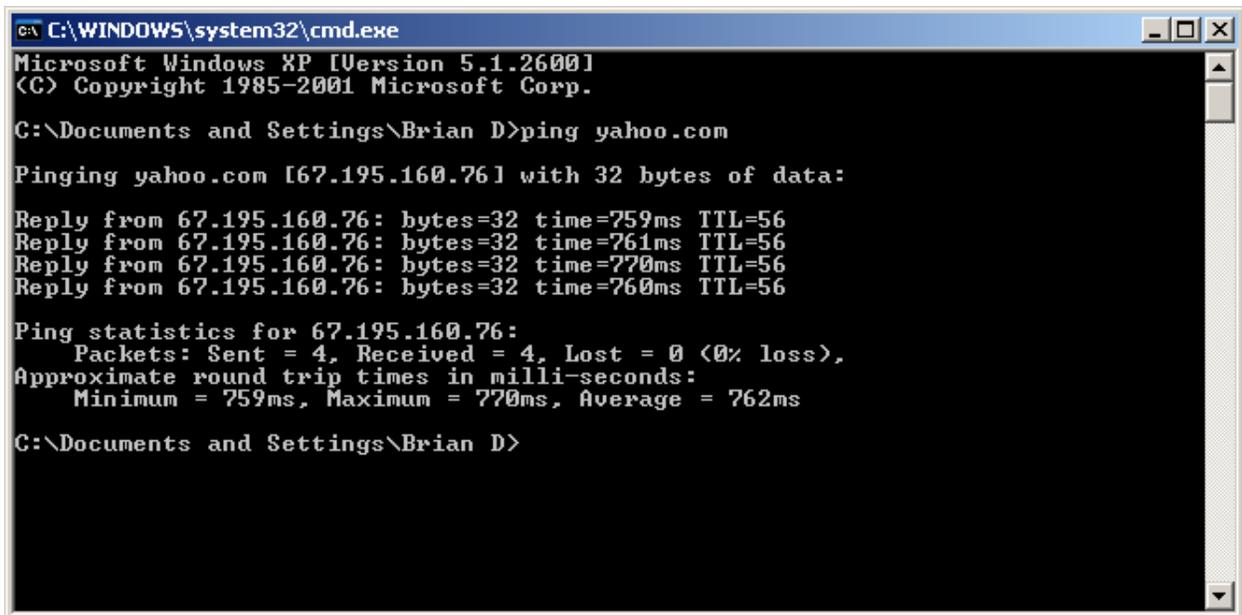
Figure 1: Round trip length could be as high as 100,000 miles for all 4 paths.

So how does this affect latency? Well, it does a little, but mostly it does not simply because satellite signals travel at near light speed. I say near light speed because there is some affect on the speed of light in the atmosphere. For the purpose of this paper, we will use the value 299,702,504 meters/sec (186,235 miles/sec) as our speed of light. The actual number if you are interested is 299,792,458

meters/sec (186,291 miles/sec). Now that we know the distance our signal has to travel and we know the velocity or speed of that signal, we can calculate how much time it will take. The formula $d/s=t$ should work. Let $d = 90,000$ miles, $s = 186,235$ miles per second and solve for t , or time in seconds.

$$90,000 \text{ miles} / 186,235 \text{ miles per second} = .438260 \text{ seconds}$$

The total time from earth station A to the satellite, down to earth station B, then back again to earth station A will take a minimal .44 seconds (rounded) or 440 milliseconds. Not much latency there. What we have not taken into effect is overhead, which is what the computers are doing during the processing and moving about inside the satellite. It takes another 200 to 300 milliseconds all the way around, or .2 to .3 seconds. How can we test this? You can do a ping command from your DOS prompt to any website in the world. You will get a reply back (if they allow it) and you will see the latency, or round trip time in seconds.



```
C:\WINDOWS\system32\cmd.exe
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\Brian D>ping yahoo.com

Pinging yahoo.com [67.195.160.76] with 32 bytes of data:

Reply from 67.195.160.76: bytes=32 time=759ms TTL=56
Reply from 67.195.160.76: bytes=32 time=761ms TTL=56
Reply from 67.195.160.76: bytes=32 time=770ms TTL=56
Reply from 67.195.160.76: bytes=32 time=760ms TTL=56

Ping statistics for 67.195.160.76:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 759ms, Maximum = 770ms, Average = 762ms

C:\Documents and Settings\Brian D>
```

Figure 2: Ping of Yahoo.Com over satellite. Note average time of 762ms. Not much latency there.

A ping command and the results cannot nor should not be the definitive determination of proper operations. This just proves that one has established a link. Time is a matter of physics as we have seen, but there are other factors that we still haven't discussed yet that could very well affect your data transfer. The biggest of these is contention and where on earth you data is routed. One method for finding out where you data is going is to perform a trace route.

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C:\WINDOWS\system32\cmd.exe
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\Brian D>tracert yahoo.com

Tracing route to yahoo.com [209.191.122.70]
over a maximum of 30 hops:

  0  7 ms    3 ms    6 ms    10.20.0.1
  1  14 ms   1 ms    5 ms    2-207.io-global.com [125.213.207.2]
  2  530 ms  519 ms  520 ms  rtr-lrm05-s3-7-1.sta.newskies.net [210.5.220.97]
  3  548 ms  614 ms  521 ms  rtr-cor02-vlan31.sta.newskies.net [210.5.192.113]
  4  525 ms  524 ms  530 ms  i-5-4.hhtstcbr02.net.reach.com [134.159.125.145]
  5  520 ms  535 ms  518 ms  i-11-0-0.hkhh-core01.bi.reach.com [202.84.154.189]
  6  703 ms  692 ms  698 ms  i-12-1-1.sjc-core01.bx.reach.com [202.84.144.69]
  7  805 ms  727 ms  677 ms  i-1-1.eqnx02.bi.reach.com [202.84.251.85]
  8  692 ms  692 ms  697 ms  yahoo-peer.eqnx02.pr.reach.com [134.159.63.162]
  9  702 ms  710 ms  704 ms  ae-4.pat1.dnx.yahoo.com [216.115.101.148]
 10  763 ms  723 ms  725 ms  as-3.pat1.da3.yahoo.com [216.115.96.38]
 11  758 ms  721 ms  730 ms  ae-2-d120.msr1.mud.yahoo.com [216.115.104.89]
 12  773 ms  733 ms  722 ms  te-8-2.fab2-a-gdc.mud.yahoo.com [209.191.78.157]
 13  758 ms  732 ms  *      te-9-2.bas-c1.mud.yahoo.com [209.191.78.169]
 14  730 ms  732 ms  720 ms  ir1.fp.vip.mud.yahoo.com [209.191.122.70]

Trace complete.

C:\Documents and Settings\Brian D>_

```

Figure 3: Result of a Trace Route to Yahoo.Com. My data is going through a lot of routers/servers!

Look at line 3 of the trace route. Here you will see the first location on earth that handles your data off of the satellite. This is usually referred to as the Hub Station. As you can see this only took approximately 530 milliseconds.

Contention

Here is a term one will seldom see, and if you do see it, it may be with or without a value. If there is a value attached, like 10:1, do not be misled by this number. I will go into great detail here because this is where the “latency” is really seen. Contention will literally kill your down-stream speed to almost nothing. In the simplest of terms, contention is modem waiting to send your data or the data to be returned to you.

For now, let’s just forget about the time that is required to transmit a signal round trip. We’ve proven that it is fast, no doubt. We need to concentrate on contention ratios. What does it mean and how do we work around it? Unfortunately if one is buying service from a local vendor and accessing the net either wirelessly or through an internet café, one has no option but to accept the service as is.

The definition of contention that I am using refers to “rivalry” or “competition”. When we sign up for satellite service we do not get the entire bandwidth available, unless of course you want to pay an extremely high price. We have to “contend” for that bandwidth with other paying customers.

When we receive a brochure from a satellite service provider we may see different rates and prices. One may not show any contention ratio while the other may show a contention ratio of 10:1. Some will even boast 8:1 contention ratio, or even better. Let’s talk about 10:1 ratio and how it affects latency.

Before we begin, let's go to a party with ten other people. There are two pies presented, one cherry and one apple (not important). You don't get a choice of which pie you want because one pie will be awarded to one of the attendees. That means this person will get the whole pie, or 1:1 ratio. The other 9 attendees, plus yourself, will get to split the remaining pie by 10. You will each get 1/10 of the pie. Now, suppose three of those attendees decided to leave and they did not want any pie, what happens? The 10 slices will not be available to the remaining seven attendees. That means more pie for everyone.

Look at the satellite bandwidth, or the transfer data rate, as a piece of the pie. With a 10:1 ratio, you will only get 1/10 of the available bandwidth. That means, say for a 128kbps circuit, you will get only 12.8kbps for your use. That is a far cry from the advertised 128kbps, but it is not false advertising. Now, if the other customers do not use the service while you are using the satellite (fat chance) you may get all 128kbps. However, do not expect more than 12.8kbps at the most. This keeps matters simple and when you get more you will be happy.

What about the service that is cheaper and does not list a contention ratio? Well, there is no way of knowing how many customers will be using that bandwidth. It could be 12:1, 25:1, or even more. One is dealing with an unknown quantity here, and one gets what one pays for. Just be cautious.

Some companies present you with an alternative solution to their higher pricing. They convince you that you can save money by bringing in 10 or more of your friends. True, you can split the cost 10 or more ways, but what will that do to your contention ratio? Do the math. If you already have a 10:1 on the satellite and you add 10 more friends to your already limited 12.8kbps, you will end up with a 100:1 ratio or 1.28kbps each. That is if everyone is using the system at the same time. Is it really worth it? Imagine the complaints you would get if you owned the system and your friends couldn't even open a simple webpage.

One has to look at all the options available, do the simple calculations to determine how much of the pie everyone is going to get, and the total cost of the system. Remember, you may not be ordering just the service, you might have to spend money for the equipment as well. That will be our next discussion.

What you will get

If I were to buy my service from a local vendor, all I will need is my computer and their login information such as a user ID and a password. That's it. If the service is wireless then there is nothing more to do. Just login and we are surfing the internet and sending/receiving emails.

But what if one wants to use one of the many available satellite service providers? What will be needed to make a connection to the internet? The brochures I have seen so far have listed service and equipment separately. Just like buying a cell phone and a plan. The plan will dictate how much the phone will cost. Same is true with satellite internet service.

One provider listed all their rates (without listing the contention ratio by the way), what those rates cost per month, and how much the equipment cost. I noticed, just like with cell phones, that the higher the rate one chooses, the higher the service cost and the lower the equipment cost, to the point of it being

FREE at the higher rates. This was also noticed on the listings for the 10:1 contention ratios, which were higher in cost for the service but lower in cost for equipment.

The provider has to make money somewhere. With the lower rate plans, the cost of equipment was high even though the equipment used for several of the rates was the same. But that is a part of doing business.

For the most part, one will receive a 1.2 meter satellite dish, a Block Up Converter (BUC), and a satellite modem. The modem will be connected to your computer with an assigned IP address. This modem will then be connected to the BUC with a pair of Inter-Facility Link (IFL) cables. The BUC sits at the end of the Satellite Dish and is used to transmit the data to the satellite. Reception is similar and requires no additional equipment. When connecting the cables to the equipment, it is important not to cut the length of the cable any shorter than what is provided. This could result in damage to the equipment.

There is the possibility that you can purchase some ones equipment. Maybe a colleague who is departing soon. Could this be a windfall in savings? Possibly, but the service provider may charge you a fee for shutting down the previous users service and starting yours. Regardless, the service provider is going to make money on this deal. Contact the service provider to find out what would fees, if any, they will charge.

A few things are missing from this list that the provider may not sell with the equipment. The first would be a mount for the satellite dish. That needs to be provided by the user. The second and most importantly is installation. One will need to seek out an experienced satellite installer to point the dish. It is somewhat of a simple task but could be confusing and may result in interference to other users on the satellite if done improperly.

Conclusion

After reading all of this, one should not be afraid of commissioning a company to provide your satellite internet service. Knowing the correct terminology and how satellite internet access works, one can make the right decision for one's own needs. There are inexpensive solutions available - you just have to find them. If you do find an affordable satellite provider, don't try and sell your portions out to others. You may end up not having a reliable service at all. Think things clearly and do the math. Remember, if a satellite provider does not tell you the contention ratio, it may be very high. A 10:1 contention ratio is good and 12:1 is acceptable. Both can be inexpensive if you chose the right transfer data rates. And as always, be safe.



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