



Bandwidth, Contention, and Profits: Combating forces working against efficient, profitable delivery of quality data services

By Bruce Bahlmann, CEO ■ *Birds-Eye Network Services*

Whether your company offers data service to businesses, residential consumers, apartment dwellers, or university faculty and staff, the effort required to provide quality data services becomes increasingly complex as you add customers or users. Contention is one of the most significant forces working against your efforts to deliver cost effective quality data services to your customers. Contention forces you to use more and more of your available Bandwidth to control who has access to your shared service.

Contention is created when you have a resource that two or more entities want a certain amount of, but each entity can only obtain a fraction (if any) of that amount. The phone company works this way – as if everyone in a city picked up his or her phone to call someone only some portion would get through. Most data services are also provided in this fashion, only the level of contention (or over subscription) can become impossible to keep in check. At what level of contention would an average customer begin to complain or become unsatisfied with your service, and begin looking at alternatives? There is no simple answer to this question – however the right answer is "it depends". It depends on what market you're in, where your customers are located (geographically), what day it is,

what time it is, how long people typically use the service, whether you charge by the bit or for flat rate, etc.

There is a direct correlation between bandwidth and networking costs. As the bandwidth of links increase, equipment, personnel, and ISP or Internet provider costs also increase. Typically the slowest link is the one you need to regularly pay for – the link that connects your customers to the Internet. However, the size of this slowest link ultimately determines how many customers your service can support. For example, let's say you provide services to an MDU and have purchased a T1 from your Internet provider. Depending on how you divide this T1, will determine your profitability. For example you could sell 12 apartment residents a symmetric 128kbs service over that T1 – as a result you have zero contention (very happy customers) because everyone is allotted a dedicated slice of your T1. But how do you squeeze more money out of that T1? You do this by increasing contention.

The phone company uses something like 82% contention – meaning that there are only enough lines available for 18% of its customers to use their phone at the same time. This 82% is based on many years of well-honed usage statistics and seems to work reasonably for all but the most extreme circumstances. Data service is much different from

phone service in a positive way in that it can be shared, and in a very negative way in that any one customer can entirely consume all (or a major portion) of the available bandwidth.

What kind of contention should you size a data network for? Start with 20% and gradually work your way up to 50%. Beyond 50% you may be playing with fire as when you pass 50% it requires constant vigilance of your network engineers in order to maintain reasonable customer satisfaction. Using 50% contention in our earlier example of the T1, we can calculate the number of customers such a network could support:

$$\begin{aligned} 0\% \text{ contention} &= \text{bandwidth} / \text{service} = \\ &= 1,536 \text{ bps} / 128 \text{ bps} = 12 \text{ customers} \\ 50\% \text{ contention} &= (1 + \% \text{Contention} / 100) * (\text{bandwidth} / \text{service}) \\ &= (1 + 50 / 100) * (1,536 \text{ bps} / 128 \text{ bps}) \\ &= 18 \text{ customers} \end{aligned}$$

Before the telecom meltdown, most large ISPs sized their links for 50% contention. By using this 50% mark, ISPs were able to leave enough headroom for the uncorrelated usage spikes that happen daily on shared networks. Now that the bottom has fallen out of the market, the amount of contention is being pushed well beyond 50% to the point where it is beginning to impact service quality and customer satisfaction on a daily basis. If you relate this to the 88% contention used by phone companies, running a network in excess of 50% contention is similar to building a phone network that would max out each day when people returned home

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from work. Imagine what your satisfaction for your phone service would be if you would hear the words "all circuits are busy, try again later" on a regular basis.

Rural area data networks could probably get away with contention as high as 88 % - especially if they have a captive audience (the only alternative is dialup). However, in larger cities and metropolitan areas where alternative options are numerous, your best bet is to provide quality service at a competitive price now over trying to improve services at the 11th hour. If you must keep contention in check, how do you turn a buck?

Think of this purchased bandwidth as a leaky bucket you want to keep draining. Your Internet provider supplies a steady stream of water to keep the bucket full and each leak represents

a customer using the service. As long as the water level is decreasing (but not empty) you are making money. When everyone is offline, the water coming into the bucket spills over the top – result, wasted opportunity to capitalize on your bandwidth investment. There are few providers that seem to exploit the concept of continually using the bandwidth they have purchased. Your challenge for profitability in this space is to diversify. Rather than relying on a one dimensional offering that serves only individual subscribers for all your income, look at patterns of usage to determine when your bandwidth is idle (no contention), then execute plans to exploit your bandwidth in other ways at those idle times. Make your goal to sell your bandwidth 24hrs a day, 7 days a week to a range of customers whose usage patterns rarely overlap. For

example, when your MDU customers go to work, sell that excess bandwidth to commercial customers. When they go to bed at night, sell that bandwidth to companies offering backup services, etc. Keep your options open and your service offering multi-dimensional. Your quest to diversify your customer base and exploit your available bandwidth is the way to keep your bucket leaky and your profits soaring. ■

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