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COMMUNICATIONS

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BAY AREA INTERNET CIRCUIT TYPES

◼ Contents

Bay Area Internet Circuit Types

Glory be, Internet circuits are now finally available in a wide variety of types and technologies. In the not-so-distant past, small businesses in the Bay Area were limited to DSL and T1, both slow and expensive. Fast forward to 2014 and Internet Service Providers now offer Ethernet over Copper, Fiber, Wireless and Cable, in addition to the old standbys.

This document defines the various circuits available in the San Francisco Bay Area and their applications.

What's Special About "Bay Area Internet Types?"

Unfortunately, the U.S. has a weak national policy of ensuring that all businesses and individuals have access to high quality broadband Internet. This translates into wide differences in service availability and speeds depending upon where you are located.

Yes, oddly enough in this high tech mecca, we have areas that have less Internet bandwidth than Lithuania. There are buildings in downtown San Francisco, where a 100MB fiber circuit costs less than the company's monthly coffee budget. Contrast this to the Internet-drought stricken area along the Bay side of the 101 and 580, a no-man's land of Internet access where a sickly 1.5MB of Internet still costs hundreds of dollars a month.

So, the bottom-line is that the San Francisco Bay Area is a unique Internet circuit marketplace. The purpose of this document is to describe the various attributes of Internet circuits available in the Bay Area and types of technologies used to deliver them.

■ Technical Background

Synchronous vs Asynchronous:

Synchronous circuits maintain the same speed in both directions, uploads as well as downloads. Synchronous circuits are designed by carriers to be "business quality", meaning that they have greater reliability, closer monitoring and guaranteed service level agreements (more on this later). Synchronous circuits are the best Internet connectivity you can buy.

Asynchronous circuits have a higher downstream speed (from the Internet to your office), and a considerably lower upload speed. A typical asynchronous circuit has approximately five times more download than upload capacity. If the circuit is used primarily for browsing web sites and downloading files, this speed difference isn't terribly bothersome. However, if the circuit is used for cloud applications, substantial file uploads, or voice, the slower upload speed becomes a crippling factor. Cable and DSL are the two most popular asynchronous circuits. The bottom line is that asynchronous circuits have much higher download bandwidth than the synchronous competitors at a similar price point. However, they are less reliable than synchronous circuits, and the actual bandwidth you get is substantially less than advertised.

Oversubscription:

Asynchronous speeds vary by provider and time of day. How can that be? Aren't they all using the same technology and selling the same product? For the most part, yes, the technology is quite similar. The difference in speeds between providers is usually a matter of capacity. It's obvious that not every Internet circuit user is online simultaneously and using their circuit at maximum capacity (i.e. uploading a large file and doing heavy browsing).

So, carriers don't provide bandwidth using these theoretical numbers as it would be expensive and the bandwidth wouldn't all be used. So, the carriers have individual formulas that they

use to determine what bandwidth is required to adequately serve a specific number of users (otherwise known as subscribers). An Internet circuit provider who wants to maximize profits, allocate less bandwidth at the result is slower speeds, regardless of advertised pricing, is a practice called over-subscription.

Another tricky aspect for the DSL and cable companies is that usage fluctuates widely during the day. Cable was born as a consumer product and as such, it serves residential areas and has only recently moved into commercial areas. When kids get home from school, they use their computers and televisions, so overall Internet performance suffers. Over-subscription is just another element to consider when dealing with asynchronous circuits. Having considered all of their weaknesses, asynchronous circuits have their place in some small businesses as they are inexpensive and reach where other services don't deliver.

Best Efforts Performance:

Asynchronous circuits, such as DSL and cable, are both services that are provided on a "best efforts" basis by the carrier and do not have a guaranteed service level. This means that the carrier will not guarantee speed or up time.

While both DSL and cable are improving every day, putting VoIP on a best-efforts circuit gives you "best efforts quality". For businesses that do not use VoIP, nor rely heavily on the Internet to conduct business, DSL or cable can be adequate. For business-critical users, best-efforts probably isn't good enough.

Service Level Agreements (SLA):

A service-level agreement (SLA) is a contract between an Internet Service Provider and a customer that specifies minimum levels of performance, and provides for a billing credit for failure to meet those levels of service. While SLA's don't eliminate failures or circuit problems, they do provide the necessary incentive to maintain high reliability and performance.

SLA's are only provided on synchronous circuits and although widely provided, they are not a standard feature of all carrier's circuits. Also, the measurements used and credits given vary widely by provider and product. Buyers must dig in and examine the SLA of each provider.

Types of Internet Connectivity

Fiber Circuits:

Fiber has been in use in enterprise businesses for years, but is now being widely installed in small business offices. AT&T alone is spending $6B by 2015 on fiber connections for businesses. Fiber circuits can handle vast amounts of bandwidth, but even with the massive build-out of infrastructure, fiber is not and will not be everywhere. If you are in a building with many tenants and in a relatively densely populated area, your chances of getting a fiber connection are pretty good.

- **Bandwidth:** 5MB to over 1GB
- **Types:** Synchronous, bandwidth guaranteed
- **Price*:** $599 for 5MB, $1,799 for 100MB
- **Lead time:** 3 weeks to one year
- **Cons:** Not every business qualifies, potentially long lead times, not for very small businesses

If you are lucky enough to be located in a building that is "lit", meaning that it already has fiber installed, the lead time can be very short. Some carriers have been known to turn on service in as little as a week. However, if the fiber has to be delivered to the building, you could be in for a very long lead time. First, it's a matter of construction; not big construction, but nonetheless outside construction work. Second, there is a large backlog in the Bay Area of "fiber build-outs" as they are called, and you'll be on a waiting list.

Ethernet over Copper (EoC):

Ethernet over Copper (EoC) is new to the small business. This product used to be called "Metro Ethernet" and wasn't widely deployed. However, when the cable companies started delivering inexpensive bandwidth, the phone companies re-discovered it in a big hurry. EoC uses the phone company's existing copper wires and "bonds" them (up to 24 pairs)

to increase speed. It is the least expensive business-class synchronous data circuit. This service is not available to businesses located over 16,000' from the carrier's central office.

- **Bandwidth:** 1.5MB to 50MB
- **Types:** Synchronous, bandwidth guaranteed
- **Price*:** $249 to $1,799
- **Lead time:** Three weeks to three months
- **Pros:** The least expensive synchronous Internet bandwidth available
- **Cons:** Must be near a central office, less reliable than fiber

Cable:

Cable companies got into the Internet circuit business a number of years ago in a big way and made billions of dollars in investments. Today, their salespeople are busy trying to fill the huge network that they built.

With all of that capacity, the cable companies are able to provide cheap and plentiful bandwidth at very enticing prices. However, cable companies offer their service on a "best efforts" basis, meaning that they don't guarantee quality or reliability. For smaller companies, this "best efforts" approach can be adequate, but expectations need to be managed. It has been our experience that "your mileage may vary" but in general is good enough for smaller offices (less than 15 users). If you are using VoIP, it is recommended to establish QoS on any cable circuit to prioritize voice or better yet, deploy a second cable circuit dedicated to voice.

There is a caveat when working with Comcast in the Bay Area; they will knowingly sign contracts for locations in which they do not have service. They then attempt to strong-arm the landlord to pay the construction costs and try to sell other customers within the building. If they are not successful, they will refuse to deliver service and present the customer with the construction bill to proceed. The highest construction bill that we've

seen was over $100,000. The customer promptly ripped up the contract. Just beware that signing a Comcast contract is not a guarantee of delivery.

- **Bandwidth:** 3MB upload/20MB download - 20MB upload/150MB download.
- **Types:** Asynchronous, bandwidth – best efforts
- **Price*:** $39 - $199
- **Lead time:** One month to infinity
- **Pros:** Inexpensive
- **Cons:** Asynchronous, patchy coverage, worst customer service in the industry

T1:

T1's are old and slow, but reliable. A single T1 has 1.5MB of bandwidth and is synchronous. T1's are available everywhere. They can be bonded together to increase bandwidth to 6MB.

T1's are rapidly being replaced by newer technologies, such as fiber and EoC, that is less expensive to maintain and provides much greater bandwidth. However, if you have a contract, you'll have to keep your T1 until the contract expires. Until then, you'll have a high quality/low bandwidth Internet circuit.

- **Bandwidth:** 1.5MB – 6MB (four T1's bonded)
- **Types:** Synchronous, guaranteed bandwidth
- **Price*:** $240 - $970
- **Lead time:** 3-4 weeks
- **Pros:** Drop dead reliable, available everywhere
- **Cons:** Expensive bandwidth, doesn't scale to higher speeds, uses ancient technology

DSL:

DSL is the grandfather of Bay Area Internet connectivity and is an asynchronous service.

- **Bandwidth:** 1.5MB down, 384K up / 3MB down, 768K up
- **Types:** Asynchronous
- **Price*:** $29 - $50
- **Lead time:** 1-2 weeks
- **Pros:** Inexpensive
- **Cons:** Low bandwidth, rarely delivers anything close to advertised speed

ADSL2+:

There is a newer type of DSL called ADSL2+, an improvement over traditional DSL. AT&T (U-Verse Max), Sonic.net and TelePacific are local providers who utilize this technology. ADSL2+ can minimally support VoIP, unlike standard DSL. It works well in very small environments. Having said that, any form of DSL is the least suitable choice for VoIP and a hardware QoS device is highly recommended.

- **Bandwidth:** 12MB down, 1MB up / 40MB down, 3MB up
- **Types:** Asynchronous, bandwidth – best efforts
- **Price*:** $29 to $99
- **Lead time:** 2-3 weeks
- **Pros:** Inexpensive
- **Cons:** It's still DSL and best efforts. Don't expect much customer service at this bargain basement price

Fixed Wireless:

Fixed Wireless Internet circuits run the gamut of speed and quality, depending upon the provider. There are many different types of technologies and frequencies used for wireless data and each produces different results. If you are using VoIP, make doubly sure the wireless provider supports voice. Make sure to ask about their voice service level agreements.

Fixed Wireless does not have the high infrastructure cost of other technologies – a wireless antenna is a fraction of the cost of laying a cable in the ground. However, it is not a perfect solution. Some fixed wireless systems are susceptible to transmission degradation due to inclement weather. Fog is their worst enemy so one can quickly conclude that would be quite a problem in the Bay Area.

Fixed Wireless Internet connectivity in the San Francisco Bay area is most frequently seen in areas that are too far from the phone company central office to provide EoC or fiber. There are pockets of the South Bay and commercial areas, such as Benicia, where wireless is more prevalent. TelePacific bought Covad's wireless division a few years ago but they haven't pushed it. You can read between the lines here.

Wireless is a technology that requires line-of-sight. This means that the two wireless antennas must "see" each other to transmit data. It is not unusual for a fixed wireless company to bounce signals off of a couple of different antennas to reach their final destination.

With so many variables and limited geographic reach, it's hard to generically speak to the suitability of wireless Internet for Internet connectivity.

- **Pros:** Can provide high bandwidth at a low price, available where other services can't reach
- **Cons:** May be susceptible to weather, most providers are very small companies

4G Wireless:

4G, also known as LTE (Long Term Evolution) is the latest iteration of data on mobile phones. What many people don't know, is that is has the potential to deliver Internet bandwidth to fixed locations, such as businesses. It already has seen fairly wide adoption in Europe.

However, in the U.S. it is still a nascent technology, yet to take off. As the mobile providers ramp up their investment in data capacity, expect them to begin pushing into this market that to date, has been controlled by the hard-wired carrier world.

For now, it is a technology to watch.

Equipment & Contracts

Internet Circuit Routers:

An Internet circuit requires a router at the customer location. This router can be provided by the customer or the carrier. Carriers charge a monthly fee for this piece of equipment. This is called a "Managed Router".

Advantages of a Managed Router:

The carrier is responsible for monitoring and claim that they can monitor your circuit if they provide the router. It's proven to have dubious value in real life.

Advantages of Customer-Provided Router:

- Over the long haul, it's less expensive
- Customer maintains complete control (carriers do not allow customer access to their managed routers)

Internet Connectivity Pricing:

The price ranges quoted in this guide are based upon averages in the San Francisco Bay area in September 2014. As the phone companies (Verizon and AT&T) continue to furiously build out fiber capacity they will begin competing with the other technologies on price. Prices tend to fall at the end of every calendar quarter as companies are trying to reach their sales quotas.

Contract Duration:

Carrier contracts are typically available in one to three year terms. Carriers all lead with three year terms. If a customer terminates the contract before the expiration date, there is a penalty ranging from 50% to 100% of the value of the remaining term of the contract.

■ The Buying Process

How to Buy Internet Circuits:

Step #1: Do you have a contract with your existing provider? If so, stop now and wait until the contract expires. Most carriers' early termination fees are the equivalent of maintaining the service until the end of the contract term.

Step #2: Determine what services are available in your area. Don't waste time on getting quotes for a service that can't be delivered to your office.

Step #3: Get multiple quotes, at least two.

Step #4: Negotiate, but keep in mind that cheap is usually your worst choice.

Your best choice is to use an agent who represents all of the major carriers and who can do the comparison shopping for you.

Using an Agent for Internet Circuits:

Internet circuit providers sell their services through direct salespeople and through a network of independent agents.

There are many advantages to utilizing an independent agent. First, they represent many providers and can do the legwork in determining service availability, quotes, and terms for the various providers. Theoretically, they are not biased towards a specific provider. They also have considerable knowledge about the "soft" aspects of carrier evaluation, such as if a provider implements service well, if they provide quality customer service, and if they bill accurately.

Independent agents are paid on a residual basis, meaning that when you pay their bill, the agent gets paid. That creates a situation where the person who sold you the service, is highly motivated to keep you happy.

■ Conclusion

The absolutely great news is that San Francisco Bay Area Internet options are growing. Average speeds are increasing and the quality of connections continues to improve. Prices should continue to drop as the competition increases.

The Cloud, including Virtual PBX, SIP Trunking and Cloud-based data services are quickly becoming an important part of everyone's business. An organization's Internet connectivity is no longer just about surfing the web, but is a crucial connection to many vital services and plays a huge role in customer communications.

TeleDynamic can help create an Internet plan for this new world that includes Cloud, Virtual PBX, and mobility. We have more than 30 years of experience in the world of data circuits, and we're not a one-product company; rather an organization that knows all of today's Internet and Cloud-based providers and services. Call us to hear about our success stories or better yet, engage us to explore your Internet and communications options.

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