Your on the
Street Reporter

Uyless Black

Net Neutrality: Who Will Control the Internet?

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(Researched and written in 2014)[1]

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[1] An expanded and more detailed explanation of the topics in this essay are now available in the book by Uyless Black, *Digital Societies and the Internet: What the Present is Bringing to the Future* (Hayden, Idaho: IEI Press, 2016). This book is now available at Amazon.com

I: Issues

The issue of Net neutrality is a prominent topic in the news. The legacy of unrestricted and relatively free use of the Internet is breaking-down. This issue and how it is resolved will affect *every* user of the Internet.

In the United States, rulings and legislation on Net Neutrality are coming forth from Washington, DC. The FCC and Congress, with the courts refereeing, are debating if companies who transport emails, movies, phone calls, and other images through the Internet can place restrictions on how this traffic is delivered to the end-user. General discussions and findings are being made available for public comment. The FCC anticipates having its final rulings in place by the end of 2014.

These potential restrictions raise many questions, some of which run counter to the legacy of the relatively free use of the *Net*, as the Internet is often called. The issues are complex and bring up scores of legal, technical, social, and political questions. Notwithstanding these complexities, the myriad issues boil down to the question of *Who will control the Internet?* If this question is too broad, it can be reframed: *Who will control which parts of the Internet?* Here are key issues dealing with control of traffic:

- Giving *precedence* to (say) email and file transfer traffic delivery over video, photo, and voice traffic: Discriminating between different *types* of traffic.

- *Throttling* the delivery of one party's traffic, but speeding-up that of another party: Discriminating between different *users'* traffic.

Net neutrality means any type of *Internet provider,* such as Comcast, Google, Verizon, and AOL, treats *all* traffic on the Internet the same way. There is no discrimination or varying charges because of the user or amount and type of traffic.

Historically, the Internet has been neutral to these issues. From its inception, the design has been that of a best-effort delivery service for any kind of traffic, regardless of the sender or receiver(s) of the traffic. Some exceptions exist, such as flow-controlling traffic to prevent saturation and network congestion, but this kind of discrimination has been applied to all traffic, regardless of its diversity. In addition, managing traffic has been a simple task, because this data has traditionally consisted of short email messages or file transfers of modest sizes.

Not so today. Long gone is the Internet that once transported only emails and small files to people sitting at semi-teletype work stations. Now-a-days, these "older" applications must share the Internet with interactive games, video streaming of movies and TV shows, photo downloads, and "phone" conversations. Indeed, traffic diversity and varying user requirements for this traffic are a big part of the Net neutrality issue.

Given this environment, if a company controls the Internet physical channels (wires, cables, radio waves) that are used to transport these images, this company has a different opinion about Net neutrality than a company that does not own this media, but uses it. This latter company, which I identify as a *content provider* places traffic (say, a video clip) on a channel.[2] The channel is owned or otherwise controlled by a company called a *channel provider*.

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[2] For this paper, I use the term *content provider* as a broad term to include a content *creator* as well as a content *distributor*, with an emphasis on distributor.

Another Internet party is important to this discussion: Some companies are *service providers*, known in the industry as ISPs, for Internet Service Providers. These enterprises are the companies to whom we pay a monthly fee to provide services, especially the ability to log-onto and log-off the Internet. Other than this fundamental support service, they usually provide Internet addressing support, email systems, and a variety of applications (such as news).[3]

An initial exposure to these organizations can be confusing to a newcomer, yet they are at the heart of the Net neutrality debate. I have coined some of the names of these institutions in order to clarify what they do and what their relations are with one another. Their names are cited extensively in this article:

- **Channel provider:** Owns or otherwise controls the *physical* media (wire, cable, wireless radio frequencies).
- **Content provider:** Provides the *content* that is placed on the physical media (such as movies and games).
- **Service provider (ISP):** Provides the Internet user with the ability to login to use the Internet and exchange content.

Some companies operate as a channel provider only; others are set up as both content and service providers; still others are channel, content, and service providers. To aid in distinguishing this latter organization, I have coined a term:

- **Multi-function provider**: Provides a combination of the three basic services.

In this narrative, I use the term *Internet provider* as a catch-all phrase for these organizations. Here are examples (and these companies might disagree with the slots I have put them in): COMSAT is a channel provider; Netflix is a content provider; AOL is a service provider; Comcast is a multi-function provider.

So far, I have not mentioned the *end-user,* the individual for whom these organizations exist to service and from whom they intend to take money. For this article, the end-users will be you and me, using our PC, pads, phones, TVs, etc. as Internet end-user proxies. I will also use the term *content users* to describe these consumers.

Another term will be helpful during these discussions: *bandwidth*. It has several definitions. For our purposes, it means channel capacity. For example, the ability of Verizon's wires to handle a video clip is called bandwidth capacity.

Many companies do not fit into these four categories, but offer support to those that do. For example, Cisco, the maker of routing equipment and software, attaches its machines to the channels to relay traffic around and through the Internet. Also, some organizations are not known to end-users, yet provide vital services. For example, they operate name servers, which allow a user to key-in a simple name, such as www.UylessBlack.com, and find a physical address for this website. There are scores of other examples. The Net neutrality issues touch on some of these companies, but the focus in this paper is on the organizations cited above.

For three reasons, the mix of Internet providers makes for a complicated collage. First, and as stated in the introductory paragraph, the legacy of unrestricted and relatively free use of the Internet is breaking-down. Second, ISPs and content providers are at the mercy of the

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[3] Other companies besides ISPs provide addressing services. It's a lucrative business.

channel providers to provide them with wire and wireless pipes. If these physical channels are denied to these companies, they cannot function. Third, also mentioned above, some channel providers are also content providers and ISPs.

As a sidebar, I add a fourth (perhaps) hypothetical point. As one example, because of content provider Netflix's vulnerability of not owning the physical media, it might like also to be a channel provider. So might all content providers, or at least have assurance that those indispensable wires and radio links are made available to them at a reasonable cost. I say hypothetical because of the enormous expense and logistics of installing wires or cables in tunnels or on poles through urban areas.

However, the fourth point may not be that far-fetched. In spite of its wealth and power, Google knows of its vulnerability to channel owners by virtue of Google not being one itself. Thus, Google has begun planning to build its own (optical fiber) channels, potentially in 34 United States cities. These installations will offer competition to the local telephone and cable TV companies. Google is in the process of becoming a multi-function provider.

Crux of the Matter

Net neutrality revolves around these issues: Should bandwidth usage be subject to restrictions? Should bandwidth usage be priced? Using topical jargon, should certain parties be granted fast lanes on the Internet highway? Can others be placed in slow lanes and still receive adequate service to meet their needs? Although it is too soon to make a judgment on what the FCC will do, it appears these questions will be answered in the affirmative. If so, the next question goes to the crux of the Net neutrality debate: Who will control these lanes and their associated pricings?

It is a dogfight in relation to the future of the Internet. The rulings of the FCC, Congress, and the courts will be vital to all Internet users. We should be paying attention.

As these issues are argued during the next few months, it is certain the Internet channel, content, and service providers are going to follow that great human tradition: "What's mine is mine, and what's yours is up for grabs."

II: Internet Providers

The Channel Provider and the Content Provider
   Telephone Services. For most of America's early telecommunications history, the channel provider was, first, the telegraph company, and later, the telephone company. The content providers were you and me. We sent telegrams. Later, we talked with one another; the content was our voice. Figure 1 illustrates this arrangement. This composition is still in existence but has been altered in many situations, as explained shortly.
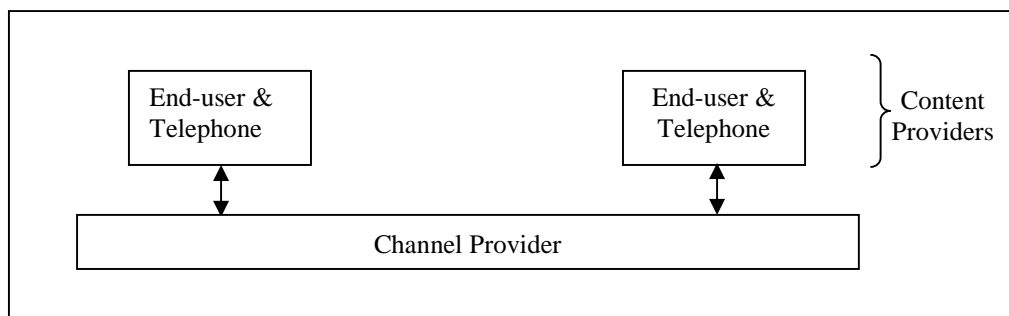
```
            ┌────────────────┐          ┌────────────────┐   ⎫
            │  End-user &    │          │  End-user &    │   ⎬  Content
            │  Telephone     │          │  Telephone     │   ⎭  Providers
            └────────────────┘          └────────────────┘
                   ↕                           ↕
            ┌────────────────────────────────────────────┐
            │             Channel Provider                │
            └────────────────────────────────────────────┘
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Figure 1. Channel provider: only the telephone company.

   Cable TV Services. The rapid growth of cable TV occurred in the 1970s and 1980s when the FCC established rules for companies to build-out cable plants and create programs for the public. The competition for building these systems was determined by the FCC, and these licenses---resulting in quasi-protected monopolies ---have become quite profitable.
   A significant aspect of government policy was the partial deregulation of the industry, stipulated in 1984 legislation. For the next several years, the cable TV industry spent about $15 billion on placing cable systems in neighborhoods and billions more on the development of content. Many readers may remember those times when sections of streets were often open trenches where coaxial cable was being laid.
   Thus, cable TV systems became a hybrid of a channel provider and a content provider. Initially, most of its business came from buying content from content originators, such as MGM, and selling it to its viewers.
   Today, over 50% of the residences in the United States are wired for cable TV. Comcast has about 50 percent of the market, with Time Warner controlling around 27 percent. The remainder of the market is divided between Cox, Charter, and AT&T.
   A proposed merger of Comcast and Time Warner would lead to a *multifunction carrier* with control of over 75 percent of the cable TV *physical* cables in America's neighborhoods. In other words, a channel provider whose content provider and service provider roles (that is, a multi-function provider) would control many of the pipes its competitors must have access to if they are to stay in business. Keep that thought in mind as you proceed through this article.
   Satellite Services. In the early 1970s, satellite-based services for retail consumers became popular. The 1972 introduction of HBO, the first national pay-for-view system, used the huge broadcast footprint of satellites to reach most parts of America; usually to a point where the cable operator received the satellite signals and relayed the movies to our homes. Thus, two channel providers were involved: The satellite carrier transported the signals over long distances to the cable TV systems, which then conveyed the signals to the end-user in urban neighborhoods.

The 1984 legislation led to more competition. It provided the initial laws for the channel provider, the content provider, and the service provider to get into one another's primary line of business.[4] It led to boot-strapping the multi-function carrier into the industry.

Satellite and Cable Operators
Cable TV and satellite services have worked hand-in-hand to support each other in order to ultimately support an end-user. This arrangement is shown in Figure 2. The content provider, such as HBO, buys bandwidth (capacity on a channel) from a company that owns the satellite or the cable TV channel. The physical media owner has been granted the use of wireless and wire-based channel frequencies by the regulatory authorities. Of course, nothing prevents a content provider, such as HBO, from having stakes in the satellite media. But historically, companies that provide content through these physical channels have relied on satellite and cable services for delivery of the content to the customer.
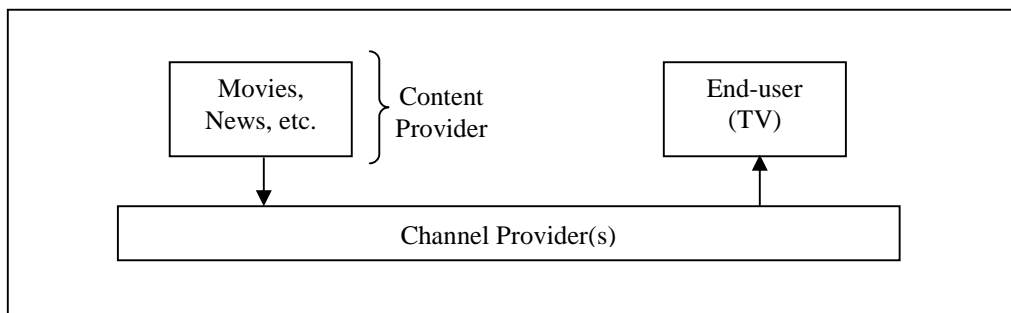

Figure 2. Channel provider: satellite and/or cable TV company.

Notice the one-way arrows in Figure 2. Originally, movies, news, etc. were sent *only* from the content provider to the end-user. The satellite and cable TV systems were designed to send-or-receive (one-way only).

Therefore, the telephone companies' customer base of two-way communications was shielded from satellite and cable company intrusion. That situation has changed. Thanks partially to the 1984 legislation (including the Cable Communications Policy Act), the cable TV systems were modified to permit two-way communications. The once inviolate two-way telephone system was open to competition, a profoundly significant change in the capabilities of cable TV.

In addition, the satellite companies have expended efforts to get into this market. For example, HughesNet offers two-way Internet communications directly over its satellite links (no phone is needed). This service is particularly appropriate for rural areas that are not wired for cable TV or broadband (high capacity) telephone lines. Because the satellites are positioned substantial distances from the earth, signal delays preclude their effective use for certain applications, such as interactive games (including the game of high speed trading). Nonetheless, for most applications, satellite Internet is a viable option, although it is not considered a major player in the Net neutrality debate.

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[4] In 1984, I hosted a live two-hour program on the PBS Business Channel. One member of a discussion panel represented the cable TV industry. He spoke of the expense of converting the system into a two-way media. He said his industry knew its path to growth and future profits was a two-way system that would support interactive telephone and Internet traffic.

Cell Phones Enter the Picture

In 1983, the United States began to deploy the first generation (1G) cell phone network. This hugely successful service was followed in subsequent years with more powerful and versatile phones and supporting networks, leading to the systems today, called 4G.

Cell phones and cell-based devices have forced a paradigm shift in the telecommunications industry. We accept them today as part of the landscape. But fewer than thirty years ago, most phone calls were made over a fixed-wire instrument. Even more, the early cell phones had no data or video capabilities. Thus, they did not demand much bandwidth from the channel provider's radio links and supporting facilities.

Today, the situation is beyond what could have been foretold in the 1980s. Mobile devices---using enormous chunks of bandwidth---are considered an integral, daily part of our lives. Taken with other end-user devices, they place great demands on the infrastructure of communications networks.

The Service Provider

The Early Internet. Prior to the placement of the Web into the Internet, the arrangement of Internet providers and end-users resembled the setup shown in Figure 3.[5] The channel provider was the local telephone company, acting in concert with a long-distance carrier. The end-user and his/her computer did most of the content creation, usually in the form of email and file transfer. The new kid on the block was the Internet Service Provider, such as AOL and Compuserve.

I have mentioned several features offered by an ISP. For this example, the ISP provided procedures for the end-user computer, through the ISP's facilities, to dial-up the telephone network, and then serve as a conduit for the computer's Internet traffic. The end-user device was the computer attached to the ISP through a telephone line and a dial-up modem. In those days (not so long ago), there were no cell phones, iStuff, or notebooks to take up bandwidth on these very low capacity lines. As late as 1984, a transfer rate of 9,600 bits per second was a "lightning technology!"
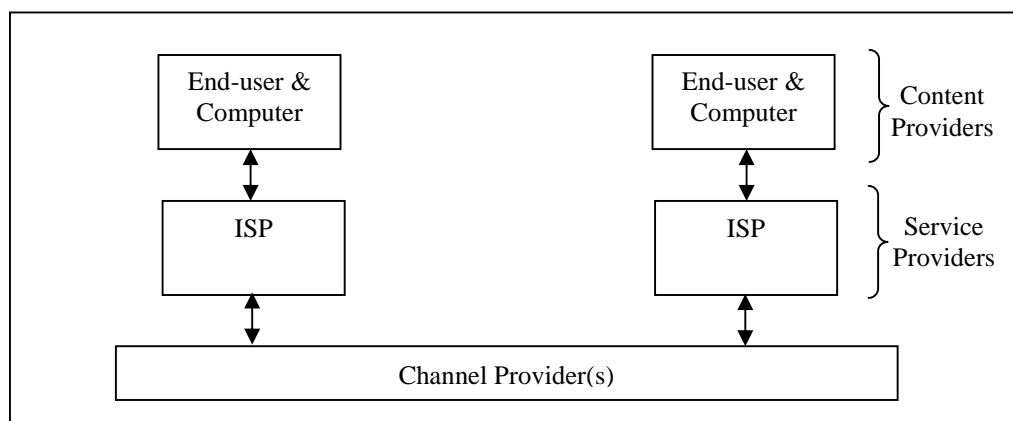

Figure 3. Early Internet.

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[5] The Web is not a separate network from the Internet. The Web uses the Internet, which acts as a transport system between web providers and web users.

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In the background were (and are) huge resources given to an end-user, an ISP, and the physical channel owner. Examples are name, mail, and file servers; routers, data base repositories, firewalls, and so on. I am not diminishing the importance of these systems, but because they are housed in the facilities of the Internet providers (or at supporting companies to these organizations), they need not be singled-out.

The Content Provider

Today's Internet is much different from that of the Internet even twenty years ago. There are more choices for the end-user in the selection of content providers and service providers. However, there are but not as many choices for channel providers. The physical channels are expensive to build and operate. Plus, with their tunnels and poles, their presence can be a distraction in local neighborhoods.

The content provider historically performed the conventional roles of email and file servers. But with the use of Web technology and modern software programming techniques, the content provider's role now goes far beyond these conventional services. Examples are Google, Facebook, Netflix, and YouTube. Other companies are getting into the end-user content management business by renting to customers their computing "clouds" containing thousands of computers that store and take care of content.

The Playing Field has Changed

Even if you and I had been fortune-tellers in the mid-1980s, I doubt we could have predicted the diversity and complexity of systems that are represented in the illustration in Figure 4. Nor did Congress; nor did the FCC. And that is partially why the Net neutrality issue has become a fairly recent topic.

No one had a crystal ball predicting: Cable TV and many satellite systems would be re-wired to support two-way communications; cellular phones would be capable of high-speed data and video transport; Twitter would become much more than a cult application; millions of people would wish to exchange pictures of their faces and other parts of their bodies with one another; cellular links would become major bypass alternatives to telephone landlines; the Web would re-define the concept of a content provider; video applications, such as that of Netflix, would grow to the point "that [Netflix] generates nearly one-third of the evening traffic on the internet in the U.S."[6]

The result of these technology surprises has led to the creation of a huge demand on the channel provider to provide bandwidth for these services. Yet this demand provides the potential for large profits if the channel provider can charge the content provider for volume and/or the type of traffic that is sent over channel provider's pipes. This issue looms large in the ongoing Net neutrality debates.

On the other hand, the content provider's web pages can reap profits from advertising and subscriptions revenue, but only *if* the content provider can control its costs of paying for the channel provider's pipes.

Naturally, these channel provider and content provider costs are passed on to the end-user, you and me. Consequently, how the FCC resolves the Net neutrality issues should be taken personally, because they will affect us personally.

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[6] http://www.cbc.ca/news/business/netflix-signs-deal-for-faster-data-speed-with-verizon-1.2626079.
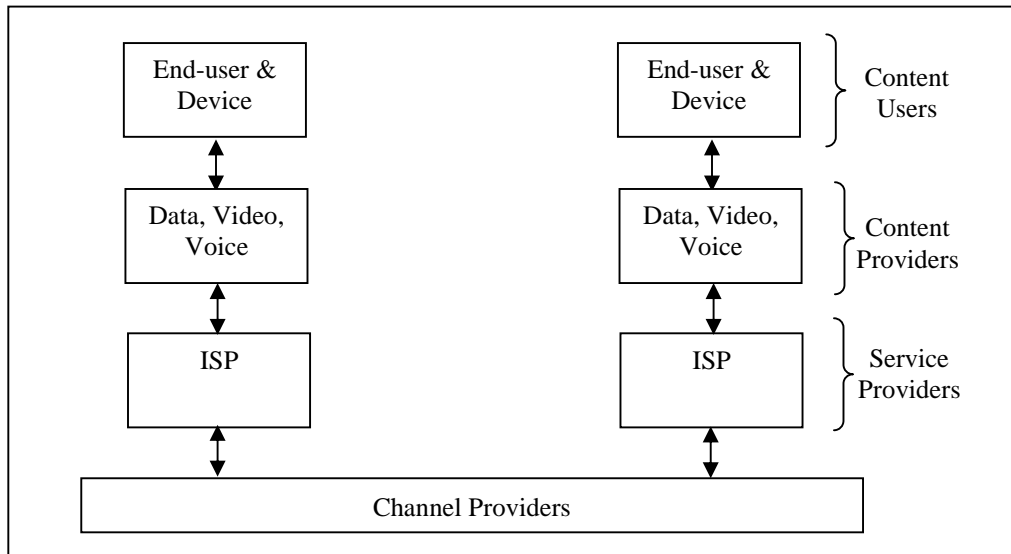
End-user & Device		End-user & Device	Content Users
Data, Video, Voice		Data, Video, Voice	Content Providers
ISP		ISP	Service Providers
Channel Providers			

Figure 4. Today's Internet.

III: From Research to Riches

The Early Internet
Because the Internet's creation and subsequent growth was nurtured and funded by the United States Government, it evolved to be considered a free utility. Granted, we have become accustomed to paying an Internet Service Provider (ISP) a modest fee for supporting our access to the Net. We accept the idea that a high-speed (broadband) channel to/from the Net should come with a higher charge; that the local telephone or cable TV company might charge us more for a service that allows us to use more of the bandwidth on the shared telephone and cable lines that run through our neighborhoods.

Thus, a significant number of America's citizens accept the idea of paying for usage, at least to some extent. As one example, the My Florida Network (MFN) has implemented a system in which customers are invoiced at a rate of $0.47 per GigaByte (GB) of traffic per month.[7]

This recent trend is at variance with the original philosophy of the Internet founders: No charge based on content or volume. The creators of the Internet designed the Internet to be open. Open in this sense: No discrimination between different types of traffic; for example, email or file transfer. No discrimination between different end-users' traffic. However, the original network that led to the Internet (ARPAnet) was (a) largely funded by the United States government and (b) traffic on these "free" channels were modest payloads of email and data files. There were no reasons to manage the flow of traffic or to charge for the use of the network.

Granted, the Internet providers had (and have) the capability to check each piece of end-user traffic (let's call it a packet), and flow-control or delete packets based on content and/or user. But this filtering rarely occurred because of the equalitarian nature of the Net, as well as the overhead that was required to perform these kinds of checks.

Also, the Internet did not filter specific packets from various competitors because the Internet was originally a network supporting only research and academic projects. In fact, business-related traffic was not supposed to be sent over the Internet (as noted, in those days it was not called the Internet).

In addition, the Internet was designed based on a concept called end-to-end control. The sending and receiving of packets were controlled by the end-users, not by the network. This idea is quite important. It gives the end-user application designer the assurance that there will be no interference from ISPs, channel providers, or content providers with the end-user's traffic. To do so might affect the design and performance of the application. This principle has had profound effects. It translates into the Internet that gradually evolved into a giant bandwidth pipe in which any application, from a modest email session to a video streaming movie, are treated the same and priced the same.

Finally, unless a component in the Internet faltered, traffic was not blocked or throttled. In the early days, there was no need to do so. The demand on the network came from modest data payloads. Video streaming did not exist. Voice over IP had been not yet been invented, nor had Video over IP. Hackers were non-existent. Viruses were found in the human body, not in a network, Stalkers did not exist. Privacy was not an issue, and all traffic was supposed to be open

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[7] The SSRC (Usage Based Network Service). See:
http://www.dms.myflorida.com/content/download/81989/470884/Network_Usage_Based_Service_Diagram_10-20-11.pdf.

anyway. With some exceptions, principally regarding security and privacy, today's Internet continues to operate on the principles cited above.

The Internet Today

While the principles have remained static, times have changed. The modern Internet teems with multi-media traffic from business competitors and non-commercial end-users. The bandwidth requirements for video streaming and interactive gaming are large. Many people are increasingly watching movies downloaded from the Internet and playing interactive video games for the better part of their waking hours.

In addition, the increased use of computers, smart phones, and tablets will lead to an associated increase of traffic on the Internet. The volume of traffic on the Net will continue to increase, and the bandwidth facilities must react accordingly. The Internet providers are continuously being challenged to satisfy this demand.

But what about those high capacity optical fibers? Their bandwidth capacity is almost beyond belief. They are supposed to be able to handle the increasing loads created by the content providers. They usually can, but after this traffic (in the form of packets) has made its way through the optical pipes, it must be analyzed by Internet routers in order to make decisions about where the packets are to go. At the final destination, the packets must also be examined by application servers to satisfy the end-user's final needs by feeding the data to specific devices and apps.

The situation is similar to customers waiting in a queue for service at a bank. The bank may staff many bank tellers to service the customers, but if customers enter the bank faster than the tellers send them out of the bank, congestion increases; so does the wait-time to gain access to a teller. Before long, customers are walking out the door without obtaining service. It is the same idea with the Internet: Too many packets in the machines' queues? They don't get serviced.

The number of packets processed by the Internet is so large it is difficult to comprehend. Consider these statistics: Some 210 billion emails are sent daily; so are 9.2 million DVD images; so are 3 million video images.[8]

This same study compared the applications (general applications, not specific "apps") that generate the most traffic in the Internet; the results are shown in the table below. You may not be familiar with some of these applications. The ones pertinent to our discussions are those ranked 1 (Web), 2 (Video), 4 (email), 7 (games), and 10 (FTP).

The growths are occurring in Web and video traffic. The study did not indicate how the researchers determined what was exclusively video, as video can use the Web for its support. This omission is not important. The important points:

- Applications that do not require much bandwidth are sending less traffic: Notably: email and file transfer (FTP, for the File Transfer Protocol.)

- Applications that require more bandwidth are sending more traffic: Notably, Web, video, and games.

- These traffic profiles are the reverse in relation to how the Internet operated in the past. Asynchronous, low-volume traffic is being supplanted by synchronous, high-volume traffic.

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[8] http://www.gerbenvandyk.com/2010/02.

Table 1. Traffic Volume and Changes.

Rank	Application	Change from 2007-2009
1.	Web	+10.31
2.	Video	+ 1.05
3.	VPN	+ 0.38
4.	Email	- 0.03
5.	News	- 0.78
6.	P2P	- 2.11
7.	Games	+ 0.12
8.	SSH	- 0.08
9.	DNS	- 0.04
10.	FTP	- 0.07

As more people migrate to smart phones and tablets; as they become more active in using video, voice, and gaming apps, traffic volume will increase. *The Economist* predicts the use of end-user devices as follows:[9]

Table 2. Predictions of Device Sales (units in millions).

Device	Shipments in 2010	Shipments in 2013
Desktop PCs	150 m	150 m
Laptop PCs	140 m	225 m
Smartphones	0.2 m	125 m
Tablets	290 m	680 m

The big bandwidth eaters---interactive games and TV videos---are predicted to increase their use of the Internet as follows:[10]

Table 3. Internet-connected Games and TV Consoles,
 Global Forecast (units in billions).

Device	Shipments 2011	Shipments 2016
Games consoles	.18 b	.25 b
TV consoles (on tablets, etc.)	.1 b	.9 b

Note the growth of TV console-based downloads; those that will increasingly be executed with very smart phones and tablets: from 1/10 a billion to almost one trillion shipments.

Who is going to pay for this growth? The content providers say the channel providers. The channel providers say the content providers. The Internet Service Providers say the end-user. The end-user says, not I; the Internet should be free!

If there are enough bank tellers to handle their customers, the traffic load is inconsequential. I agree, except the point for this discussion is that one (conservative) study

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[9] "Beyond the PC," *The Economist*, October 8, 2011, 4.
[10] *The Economist*, 16.

states Internet traffic has been growing by about 25% – 30% a year for the past few years.[11] Another study claims recent annual growth rate has ranged between 35% – 60%.[12]

How many tellers must a bank employ to keep its depositors in the queue? At first glance, it's an easy answer: As many tellers as it takes. After all, those deposits bring-in money. But here is the rub about Net neutrality: What if the bank is making no (or little incremental) money on expanding its teller stations, yet is expected to handle the increased traffic in the queues.

On the surface, it's an absurd idea, as Comcast and other Internet providers are coping with Internet growth and making fine profits. Nonetheless, the teller servers and end-user queues personify the situation with the Net neutrality debate, especially from the admittedly radical factions that claim the Internet (and information in general) should be free. These citizens claim the channel provider should provide *ever expanding* pipes (channels) to support *ever expanding* bandwidth requirements from the *ever growing* content provider community. At the risk of being sarcastic to their well-meaning intentions, I can only conclude these people have never had to meet a payroll.

On the other hand, and a big hand it is, given the history and culture of the Internet, should it be treated as just another pay-for-use facility? That is both an economic and philosophical question. And here, I do bow to the views of those who oppose any traffic discrimination whatsoever. I cut my teeth on a free Internet. It's in my heart. But for it to survive as *the* Internet, without fragmentation, I yield to my brain and say, there must be a fair price for fair usage.

Philosophy aside, the study just cited compared the applications that generate the most traffic in the Internet. The study revealed: Applications that do not require much bandwidth are sending less traffic. Notably, email and file transfer. Applications that require more bandwidth are sending more traffic. Notably, Web, video, and games.

These traffic profiles are the reverse in relation to how the Internet operated in the past and for which it was designed: Occasional low-volume traffic is being supplanted by continuous high-volume traffic.

Data Dumpers

During my perusals of news media on the subject of Net neutrality, it became evident that one important aspect of the issue is not being covered: wasted use of Internet bandwidth. Along with this revelation, it also occurred to me that some of the Net neutrality debates could be assuaged if Internet end-users would take a more responsible position on their use of the precious Internet bandwidth. The culprits, willingly exploited by this writer, are:

Previous copy. In the not-so-distant past, we responded to someone's postal letter by referring to the topic of that letter in our answer: *Dear Mildred, I received your letter about your recovery. Let me say…*etc.

If we wished to refresh our memories, we would pull Mildred's letter from our file cabinet and look it over. Today, the ISP's software can automatically place a copy of Mildred's previous correspondence at the bottom of our reply. We are not tasked with finding Mildred's letter and rechecking its contents. It is already on our screen, just below the text we enter to send back to Mildred. With this practice, as we stack a previous reply onto our next reply, and another onto the previous reply, and then stack yet another copy, we create our own house of letters. We

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[11] Cisco Visual Networking Index Forecast and Minnesota Internet Traffic Studies (MINTS).

[12] http://www.nanog.org/meetings/nanog47/presentations/Monday/Labovitz_ObserveReport_N47_Mon.pdf

never have to consult our file folders to know about the previous correspondence on this matter. It's handy and bandwidth expensive.

Each of those redundant copies translates into more characters (bytes) sent and received by email users.[13] It is a waste of bandwidth, yet some of my email pen pals become irritated if I delete these copies. Who pays for this redundant traffic? If we are on a data-usage-volume plan, we do. And the Internet provider that is charging us on volume is more than content to support our lethargy. The more urgent question, who will pay for this traffic in the future?

Forward to. During those past times, if we felt the urge to forward correspondence we had received from other parties, we placed the hard copy in an envelope and mailed it. It took a bit of effort and therefore, a bit of thought. I like the email "forward to" feature. I make frequent use of it. I also overuse it, and I find it overused as well. I receive forwarded copy of many pieces of material that I do not need or wish to receive. Again, the question is asked: In the future, who pays for this traffic?

Broadcasting. IP (Internet Protocol) broadcasting is a marvelous service. Weekly, I send to a list of several hundred email "addresses" an email with links to my new blog postings. What a fine productivity tool (and the bane of the postal services). No postage stamps. No envelopes. No paper. No printer. I would not advertise my blog this way if I did not have IP broadcasting.

My broadcasts are sent to a modest number of Internet users. Some IP broadcasts contain thousands of addresses, which means an individual packet (or packets, depending on the size of the user contents) must be sent to each recipient. Again, it's a wonderful feature, but who will pay for this traffic?

Attachments. Forwarding attachments has become a ridiculous habit of many Internet users. There is no question that I enjoy receiving funny jokes, unique YouTube videos, stunning photographs, etc. Yet, it is not uncommon for my mailbox to have scores of these downloads waiting at my ISP for my consumption. I receive too many of these attachments to open. I delete them, hoping my non-reply to a well-meaning, attachment-crazed friend will not lead to an alienation of affections. Some of these Internet users (not *my* friends, of course) are so profligate I call them *attachment spammers*. They consume far too much of the Internet's bandwidth. At the risk of repetition, who will pay for this bandwidth usage in the future?

Data Miser?

I could be accused of being short-sighted and bandwidth miserly. Others say, *Send and receive to your disk's content! Use all the bandwidth you wish. Don't stifle yourself. If you do, you will repress your innovation, productivity, and contributions to society.*

Perhaps my stand represents a digital reincarnation of Scrooge. But I maintain the view that *Internet bandwidth, if used, should be paid for*. There, I've made my stand. But this stand is accompanied with several mitigating caveats, explained later in this article.

Almost all Internet users are lazy exploiters of bandwidth. I myself feed daily at the free Internet bandwidth dining table. That is understandable. We Internet users have been conditioned to consume free bytes of this meal. In hindsight, we have become bad actors because we have not had to be responsible for our actions.

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[13] I make this assertion without having made an analysis of this subject. However, if the ISPs do *not* relay this extra data, they must have a way to examine each email and correlate the email to previous correspondence and then insert these email copies at the final endpoints. I look forward to anyone telling me how this could be done without violating privacy barriers, creating massive data bases, and consuming untold CPU cycles.

Bandwidth is not infinite. Yet, as a general observation, it appears to this writer that Internet users treat it as if it were infinite.[14] Nonetheless, many naysayers to Internet bandwidth pricing state the Net should be treated as if its bandwidth were indeed infinite. They believe pricing will repress innovation and creativity. Let's take a look at this issue.

Stifling Startups?

A large number of people are critical of having usage fees become part of the Internet because they claim it will stifle innovation, be counter-productive to entrepreneurship and the forming of creative companies. I watched an interview in which the critic asked what would become of the future Googles and Facebooks? I address this population with these thoughts.

First, since when has it been the practice to subsidize innovation by not charging the innovators the natural cost of bringing those innovations to the marketplace? It's perverse capitalism. Before I retired, I formed two small Internet-based firms. I would have loved to have been granted special privileges for Internet usage. I was not. I paid my way. From my view as a private businessman, it seems obvious that once contrived pricing (or in this case, non-pricing) takes hold, the products in that distorted marketplace suffer.

Second, let's put philosophical differences aside and look at reality. If a start-up company is using large amounts of bandwidth, this company is not starting up with a couple PCs and a few servers in the home garage. Applications that are bandwidth hungry are usually sophisticated, expensive systems. They already have had a lot of money invested in them. Before they can begin to consume terabytes of bandwidth on the public Internet, they have gone through many hoops to find funding for developing the software and acquiring the hardware to run that software.

In other words, they have already had to raise capital. By the time they begin to tax the pipes of the Internet, if their fledging product has merit, they will have ample opportunity to tax the pockets of America's capital system, or their product is already making money.

For the ongoing small enterprise, one in which the business is at home or in a modest office, I hold that if this business is indeed in need of large bandwidths, it is an exception and not the rule. I see no reason why the FCC cannot set up bandwidth dispensations for special cases, a subject discussed in more detail shortly.

Pricing for Internet usage will not put the revered Steve-Jobs-in-the-Garage tinkering genius at risk. This entrepreneur will be charged a modest fee for modest use of the Internet. If this genius invents a worthwhile product that will become a bandwidth bandit, Silicon Valley's venture capitalists will be more than willing to pitch in. And again, for the small business that just happens to need a lot of bandwidth, if we citizens and the regulators wish to cut them some bandwidth slack, let it be done and not fret about it.

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[14] Why should they not? They have not been so-informed.

IV: FCC Deliberations and Concerns

During the past few years, the FCC has been deliberating the issues surrounding Net neutrality. In the FCC paper fcc-1.2620314, the agency claims its upcoming, pending rules would allow broadband internet channel providers, such as Comcast and Frontier telephone, to charge content providers, such as Netflix and YouTube, for *priority access to customers* [my emphasis] provided the agreement is "commercially reasonable."[15]

The FCC chairman also stated, "To be very direct, the proposal would establish that behavior harmful to consumers or competition by limiting the openness of the Internet will not be permitted." At first glance, this comment could be interpreted as contradicting the statements in fcc-1.2620314. After all, granting priority access to one set of customers necessarily places another set of customers toward the back of the service queue.

However, if the Internet is going to flourish---and survive in its present "open" state---someone must pay for the expansion and maintenance of its infrastructure: its cables and wires; its servers and routers; its content. But one could ask: aren't these payments being made now? Yes, and profits aside, *increasingly, not in proportion to how much of the infrastructure is being used by some Internet users*.

There is an age-old rule governing almost all of earth's societies. It is a rule by which we humans have lived for most of our existence: We pay to others for what we take from them. There is no free ride on the backs of others. While this rule has been broken many times with humans' propensity to exploit one another, it still remains a steadfast canon for governing our behavior.

We pay for a slice of the pie for sale at the bakery. After all, the baker's ovens and dough don't come free to the baker. We shell-out money to watch *No Country for Old Men.* The Cohen brothers spent considerable time, effort, and money making the movie. We pay for the book we read. Contrary to the opinion of the "information is free" zealots, this writer has to eat in order to write.

This writer also favors charging to use the Internet based on how much of the Internet resources an Internet customer uses. You may agree or disagree with this stand. I ask you to hold judgment on this opinion until the end of this narrative. In the meantime, let's see what the FCC wishes to implement by the end of this year, assuming the courts and Congress go along. The following is sourced from fcc-1.2620314.

> The FCC [will] stop harmful conduct [to the openness of the Internet] if it is found to not be "commercially reasonable." Acting within the constraints of the Court's decision, the Notice [an FCC stand on a matter] will propose rules that establish a high bar for what is "commercially reasonable." In addition, the Notice will seek ideas on other approaches to achieve this important goal consistent with the Court's decision. [A prior D.C. Circuit admonition for the FCC to re-do its Net neutrality decisions.] The Notice will also observe that the Commission believes it has the authority under Supreme Court precedent to identify behavior that is flatly illegal.

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[15] http://www.fcc.gov/blog/setting-record-straight-fcc-s-open-internet-rules

The "commercially reasonable" law allows for considerable wiggle-room. But it will provide more flexibility than a "best effort" clause which often results in overly stringent restraints placed on commercial behavior. I favor this approach because it will likely result in the general concept of Internet openness being decided on a case-by-case basis. Admittedly, I am doubtful that America's distorted political process will not lead to abuses with this method of Internet governance. Nonetheless, the alternative of not charging fairly for the use of a monumentally expensive resource is committing commercial---and because it's the Internet under question---social suicide. (And I emphasize *fairly*, a concept in need of FCC ongoing monitoring)

The FCC goes further in its general statement, and this part of fcc-1.2620314 is where final rulings must be more specific:

> The allegation that [FCC mandated openness] will result in anti-competitive price increases for consumers is also unfounded. That is exactly what the "commercially unreasonable" test will protect against: harm to competition and consumers stemming from abusive market activity.

To be clear, this is what the Notice will propose:
1. That all ISPs must transparently disclose to their subscribers and users all relevant information as to the policies that govern their network;
2. That no legal content may be blocked; and
3. That ISPs may not act in a commercially unreasonable manner to harm the Internet, including favoring the traffic from an affiliated entity.

The term *ISP* is too general. For Internet openness to work well, with fair prices to all, the FCC must discern between the four kinds of Internet providers: Channel, content, service, and multi-function.

The focus of considerable criticism of the FCC's emerging stand on Net neutrality is about a pending rule that allows pricing and access arrangements between content providers (Netflix, for example) and channel providers (Frontier telephone, for example). This rule is restricted to the physical link between a customer and an Internet Service Provider. It is the "last mile," also known as the " "local loop."

Consequently, the FCC mandates will not go inside the clouds of any of the four types of Internet providers. They are free to do whatever they wish to do. I do not think it is technically or logistically possible to regulate what are generally called *peering arrangements* in the Internet: arrangements between Internet providers. They have been doing peering for decades without significant ill-effects on the local loop.[16]

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[16] Historically, peering has not dealt with an individual subscriber's traffic, but aggregate traffic coming through the pipe between Internet providers. If Internet peering (through the Internet Border Gateway Protocol (BGP)) evolves to be based on traffic type and specific IP addresses, the FCC approach on fair treatment at the local loop becomes even more important.

Sidebar: Revolving Doors

In *The Nearly Perfect Storm: An American Financial and Social Failure*, I made these observations about the financial industry: "Take a look at the career paths of SEC and Wall Street people. The path is a two-way conduit through revolving doors into and out of the regulator's offices and the offices of those who are regulated. … Regardless of the reputations of these men, I can't see how they can avoid conflicts of interest. I can't see how their insider information will not be used when they enter (or reenter) private enterprise. How can these people remain above the capitalistic fray between the regulator and the regulated when they alternately play both roles?"

Since writing those thoughts in 2009, brain research has revealed that previous ways of thinking in specific environments have "wired" the brain to "behave" a certain way while operating in those environments. Even without the human "owner" of the brain realizing it, a person's decisions are affected by past cerebral actions. That is why prejudices and biases are so hard to dislodge from a human's persona.

One cannot simply take off the hat of one view and put on the hat of a contrary view, without the first shading the view of the second. It's just not in the cerebral cards. And here in lies the challenge for the FCC:

The members of the FCC must somehow rise above viewing Net neutrality from the insular standpoint of being caretakers of (a) the provider, (b) the content provider, (c) the service provider, or (d) the multi-function provider. Any effective rulings on Net neutrality coming from the FCC---whose members are mostly natives of those very organizations---will require these people to get past their parochial pasts. In effect, if they are up to the task, *they will take on the role of caretakers of the Internet end-user and no one else.* In so doing, they will likely lose a lot of friends in their former industries. The coming months will witness the cloth these people are made of.

Conceivably, government oversight being restricted to the local loop could be open to abuse. For example, if Netflix is given priority within Comcast's network, this preference likely translates into Netflix's traffic arriving at the local loop sooner than the traffic from a party that does not have a contract with Comcast. Thus, the Netflix traffic could be delivered sooner than that of the other party. Nonetheless, this idea is a good one. As long as Comcast meets its obligations to *all* the other customers on the local loop, it should be free to price-out its bandwidth to Netflix and anyone else it chooses.

Critics predict future pricing and associated traffic management agreements between the big players will subvert the open Internet and lead to the exploitation of the poor and less-advantaged customers. I disagree. In addition to my comments in section III, I add: *Much of the current Net neutrality controversy can be handled by simply charging for volume of traffic (and perhaps response time) across the final mile.*[17]

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[17] To be effective, response times should be measured end-to-end, from the sending user to the receiving user. Consequently, Internet providers that support different end-users could establish in their peering arrangements the means to meet the users' response time requirements. This powerful service does not invalidate the requirement for an Internet provider to meet its local loop response time contract with a customer.

I suggest a straight-forward interpretation of volume and response time. If I do not log-on to the Internet for, say, a month, I am charged nothing. If I do use the Net and my traffic volume is 1,000 characters of data, I am charged the going rate X 1000. If my traffic volume is 1,000,000,000 characters of data, I am charged the going rate X 1,000,000,000. And if we want even more openness and fairness: no discounts will be given to high-volume users. As well, if I want fast response times, I pay for this feature.

What a revolutionary idea: Like electricity, I pay for what I use. Unlike cable TV and telephone services, which charge for non-usage of resources, an open Internet would not. The Internet providers will abhor this idea. They will maintain they must charge even low volume users to cover the overhead of keeping tabs on them and their accounts.

For technical reasons beyond the scope of this narrative, I disagree. But if so, the basic interconnect fee (sans the communications equipment needed at the user site) could be low and discounted for low-income and/or low-volume customers. I also believe an initial connection setup fee is fair. Afterwards, fees should be based solely on volume and response time, perhaps with bandwidth dispensations granted to startups (for a while), small businesses (perhaps until crossing a bandwidth usage threshold), and to Internet indigents (perhaps indefinitely).

V: Solutions

For the final section of this article, we cut to the chase: Should the Internet continue to be neutral to all traffic, regardless of its content and regardless of who sends and receives it? To start the discussion, here is the view from a content provider, Google:[18]

> Network neutrality is the principle that Internet users should be in control of what content they view and what applications they use on the Internet. The Internet has operated according to this neutrality principle since its earliest days... . Fundamentally, Net neutrality is about equal access to the Internet. In our view, the broadband carriers should not be permitted to use their market power to discriminate against competing applications or content. Just as telephone companies are not permitted to tell consumers who they can call or what they can say, broadband carriers should not be allowed to use their market power to control activity online.

No surprises here. After all, Google does (yet) not own the channel; telephone companies (and other carriers) do. Anyway, for my first recommendation.

Channel providers (the broadband carriers in Google's text) should not be permitted to "tell customers who they can call or what they can say." However, Google, as a content provider fails to mention that telephone companies are permitted to charge customers on how *much* they "say" in the form of long-distance time-usage charges. It's a well-established practice.

Google, Skype, and other big content providers now have pretty much a free ride at the expense of the channel providers and the ISPs. Bret Swanson of *The Wall Street Journal*, states that YouTube "…streams as much data in three months as the world's radio, cable, and television channels stream in one year."[19]

> 1 | *ISPs and channel providers should be able to charge customers (content providers) for how many packets they send and receive without regard to the contents of the packet or its origin and destination. For time-sensitive (say, video) traffic in which response time is important, an associated fee can be assessed.*
>
> *There should be a threshold under which the low-income user is granted some kind of financial dispensation.[20] This latter action will help allay the concerns of those who claim pricing of Internet services will lead to discrimination against the disadvantaged. This latter idea is in concert with the legacy of the Internet. Also, it fosters the idea of a universal utility.*

Moral Hazard and Couch Potatoes

I support charging for Internet usage for several reasons. First, it is folly to ask the Internet channel providers (the broadband carriers) to absorb the growing demand on the Net without their being able to recover their investment and provide a return to their investors.

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[18] "A Guide to Net Neutrality for Google Users," Google.

[19] Bret Swanson, "The Coming Exaflood," *The Wall Street Journal*, January 20, 2007, http://www.discovery.org/scripts/viewDB/index.php?command=view&id=3869.

[20] Beyond an on-going subscription fee.

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Second, it is folly to think they will continue to do so. There is nothing magic about the Internet that it cannot be replicated on a smaller scale. If vendors cannot make money by providing Internet services, they will look to alternatives. I believe any fragmentation of *the* public Internet into other public Internets would lead to more problems than currently exist. *If the FCC's rulings allow pricing but require a clear-cut minimum quality of service for all users on the local loop, no one will be relegated to Internet slow lanes.*

Third, if an Internet user has no obligation to govern his/her use of the Internet, there is no motivation for self-discipline. It's the well-known moral hazard issue touched-on in section III: If an actor is not responsible for his/her actions, the actor will often not act responsibly.

I do not want to subsidize the indolence of couch potatoes who spend most of their time using the Internet to play games and/or download gigabytes of Facebook pictures of people they hardly know. However, it would be dangerous to give Internet providers the authority to determine usage fees. Once again, I return to the key idea that some companies are both channel providers and content providers. I cannot see how a multi-function provider that sells video streaming will not grant itself a better deal for its movies than a content provider's movies. Consequently, as much as I dislike more governmental oversight:

> 2 *Pricing for services, which must be based on volume and response time, without discrimination as to content, must also be public and subject to review, and possible modification by the FCC, Congress, and the courts.*

Some of the Internet providers are not keen on this idea. They claim Uncle Sam will (as usual) muck things up, making it difficult or impossible to innovate and operate. Possibly, government is not noted for its clairvoyance.

However, as noted several times, the telecommunications industry has huge organizations that are both channel and content providers. According to sources cited here, Comcast, as well as other companies acting as ISPs, have flow-controlled certain traffic.[21] Some ISPs are discriminating against online games.

Comcast is the nation's largest cable operator and a huge player in the home ISP marketplace. It is also the fourth largest provider for residential telephones.[22] It is a huge multi-function provider. I am uneasy with a multifunction company having the power to discriminate against other content providers' competitors.

I am very uneasy about a multi-function provider having control of the set-top boxes that are increasingly finding their way into end-user systems. If not subject to fairness-of-use doctrines, it's a tool for exploitation,

I have no axe to grind with Comcast. Some years ago, I was a limited partner in the company. But I do not trust Comcast or other Internet providers to do any bidding for anyone but themselves and their stockholders. That is their job.

For sure, many of the goals of corporations lead to great societal benefits. So, I hope I am not coming across as faulting Comcast and other telecommunications companies for advancing their agendas. Critics of government oversight state it is not government's role to tell Comcast

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[21] Peter Svensson (19 October 2007). "Comcast Blocks some Subscriber Internet Traffic, AP Testing Shows." Associated Press, http://www.msnbc.msn.com/id/21376597/. Retrieved 25 October 2009.
Also, Nate Anderson (2007-07-25). "Deep Packet Inspection Meets 'Net Neutrality,' CALEA." Ars Technica. http://arstechnica.com/hardware/news/2007/07/Deep-packet-inspection-meets-net-neutrality.ars/2.
[22] From a Comcast Web site.

how to manage its network. I am in agreement. I also state that it is not Comcast's role to tell me when to or for how long to play an online game.

> **3** *Nonetheless, all Internet providers must be able to protect themselves from unpredictable surges of traffic loads, as well as isolating hackers and stalkers. The FCC should not restrict Internet providers from implementing security and traffic engineering features for self-protection, which will mean some discrimination.*

> **4** *However, statistics on the denial or degradation of service must be made available to the end-user and/or content provider, with documented justification.*

I am not suggesting Internet providers show these statistics to the general public. It's none of the business of the general public what others' traffic volumes are (although with today's "openness," it's hard to keep these secrets). I am suggesting the paying customers (with court-ordered access decrees, if needed) and the FCC have access to this data. In this way, the interested parties can work it out, without Wikileaks intrusions.

Given the best of intentions on the part of all parties, the laws of physics cannot be tossed away. There are only so many bits that can go across a channel "pipe" a one time. We don't have to try. A common sense arrangement is summarized well by Google CEO Eric E. Schmidt:[23]

> I want to be clear what we mean by Net neutrality: What we mean is if you have a data type like video, you don't discriminate against one person's video in favor of another. But it's okay to discriminate across different types, so you could prioritize voice over video, and there is general agreement with Verizon and Google on that issue.

Mr. Schmidt has his priorities reversed as video's low latency synchronous packets require a higher priority than asynchronous data packets. Nonetheless, he is on target with his general statement.

> **5** *Therefore, ISPs and channel providers should be given latitude to shape traffic according to the type of traffic, but also in accordance with pricing and performance agreements---often called the quality of service or QOS contract, an important component in this discussion---with end-users and/or content providers. For example, it is well-known how many packets can be discarded without affecting the noticeable quality of voice and video. The Internet vendors, as long as they meet the QOS agreements with all parties, should be given latitude in traffic shaping.*

I have read several articles written by critics of traffic shaping, and I will address those critics shortly. For now, other people have said that the Internet should be able to relay traffic at *wire speed*. This term means a packet goes across the Internet, passing through several wires (including fiber and wireless links), at almost the speed of light. It's not quite that fast as packets must wait in queues as well as endure a slight delay of passing through a wire or a radio wave.

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[23] David Goldman, "Why Google and Verizon's Net Neutrality Deal Affects You," CNN/Money, http://money.cnn.com/2010/08/05/technology/google_verizon_net_neutrality_rules/index.htm.

Nonetheless, it's fast. Given these definitions, today's Internet is nearly capable of wire speed service. I bring-up this subject to make this recommendation:

> **6** *Any restriction or discrimination of user traffic dictated by government regulations or Internet provider design should do nothing to compromise the Internet's current performance statistics. However, the so-called wire speed of the Internet should be based on the requirements of the application and the cost to obtain the needed bandwidth to support the application's QOS requirements.*

> **7** *As an addendum to this idea, I favor, say Netflix, being able to establish a peering agreement with Comcast to create a faster pipe for Netflix's video traffic through the Comcast internal network----as long as the universe of users do not experience a degradation of their performance; that is, no violation of their contract. Thus, if Comcast gives extra bandwidth to Netflix, it had better make sure it has that bandwidth to give, without degrading the bandwidth <u>at the local loop</u> of other customers.*

Recommendation 7 is key to keeping the Internet viable. Uncle Sam or Internet provider: Do not do anything to degrade what an end-user now has, and do whatever you wish inside your clouds as long as your do not jeopardize others' QOS. The current QOS levels should never be lowered. Thus:

> **8** *Those Internet users wishing a higher level of QOS should be able to pay more for it, without compromising the current user base services. Therefore: Do no harm to an existing Internet customer who is on the same local loop.*

> **9** *Any legislation (or for that matter, voluntary operations by Internet operators) should use the cable TV industry as its negative role model. The packaging of content should be left to the consumer, with prices set accordingly. Any legislation should not place this option into the hands of the content provider.*

The current arrangement of cable TV is akin to my ordering a movie from Netflix and also getting other downloads from 100 (or so) content providers. Yes, I know. The multiplexing nature of coaxial cable allows those 100 programs to be available. Fine, but don't charge me for them.

The End-to-End Principle

One of the design beauties of the Internet is the end-to-end principle: The network itself acts as a passive, "dumb" conduit of traffic between users. By being dumb (which it isn't, but so appears), and therefore very fast, users perceive they have direct links to one another, a nonstop pipe of bits. The network does not interfere with users' packets, other than to deliver them with a best effort. The integrity of the user traffic (packet loss, packet error, packet security penetration, etc.) is largely the responsibility of the end-user, and not the network.

This arrangement will not hold-up if the Internet continues to grow without some sort of QOS arrangement. Applications that need a "non-stop pipe" data stream will run the risk of competing for bandwidth with the Internet universe. We see examples of this situation today

when Netflix and YouTube videos experience interruption (with irritating pauses) during the playback of a video. Pricing based on QOS will require traffic shaping and traffic monitoring.

10	*Nonetheless, any control dictated by the government, and/or setup by the ISP or channel provider must keep the end-to-end principle as the foremost design goal. To change this paradigm would lead to the alteration of the very soul of the Internet. It would also lead to serious performance and design problems on the part of the end-user and/or content provider.*

The Internet Irony

Several private industries that are the subjects of this article are making millions of dollars, courtesy of the American taxpayer. They were allowed to come into existence as regulated monopolies or were granted exclusive licenses from the government to ply their trades. They are 1. local telephone companies; 2. long distance carriers; 3. cellular phone companies; 4. cable TV companies; 5. the Internet.

Critics will claim otherwise; that with the exception of the Internet, these industries were created exclusively by the private sector. Not so. Take cases 1 and 2; the Bell System became what it was because of Uncle Sam's regulated monopoly umbrella. For cases 3 and 4, the companies were given licenses (at a price for sure) to operate.

In all instances of these "common carriers" cited in 1-4, there was a level playing field, *but among a very small group of players*. That is the nature of dealing with a common resource, such as radio waves and neighborhood streets. Only so many companies can dig up city streets. Only so many companies can share the cellular phone radio frequencies.

But these exclusive licenses have resulted in huge *protected monopolies* when the idea was to promote competition. How many cable companies are deployed in America? How many cell phone companies? The answers are few, and their numbers are diminishing.

In a tinge of irony, some of these companies that are lobbying for Uncle Sam to stay away from the Net neutrality issue owe their existence to Uncle Sam. The U.S. government gave them the license (so to speak) to make this assertion in the first place.

After all the cards are played in the Net neutrality game, it comes down to a simple idea: Given the non-neutral, and often conflicting roles of Internet channel, service, and content providers; given the diverse world of Internet vendors and users, it is clear that the Internet card game will not stay neutral if the dealing is left to the hands of non-neutral parties. Like it or not, Uncle Sam will have to shuffle the deck for the Internet providers to play the game fairly for the end-users.

Fair use of a resource works in a competitive, commercial society only if the use has a fair price attached to it. A fair price for fair use policy is the best approach to the Net neutrality issue. Let's hope the FCC, Congress, and the courts see it this way as well.

Nonetheless, because the Internet is the Internet, with all the profound implications of that simple clause, it is worth repeating that the FCC must become an active advocate of the end-user and not the Internet providers.

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