

# Beyond Net Neutrality: End-User Sovereignty

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**Abstract:** This article (\*) discusses the underlying dynamics behind the present debate over net-neutrality, analyzes the pro's and con's, concludes that the debate is based on false premises, and proposes a better solution - End-user Sovereignty - that is both open and only lightly regulated.

**Key words:** net neutrality, separation, common carriage, termination, access, last-mile.

**N**et neutrality has been a hot topic in Washington (and increasingly other countries), expert conclaves, and the blogosphere. On the one side are traditional incumbent media - phone and cable companies, the carriers - in rare agreement. They do not want to be regulated, and they want to preserve the profitability potential that protects their network upgrades. They are joined by some of the hardware suppliers. On the other side is what might be called the internet-industrial complex - consisting of idealistic net community folks, small startups, large Silicon Valley corporations pretending to be both - as well as Hollywood, in another strange bed fellowship. Consumers are also part of this coalition, although, as will be shown, their interest in purely economic terms is split.

The U.S. Congress is in the middle; several bills are pending, and while none is likely to be passed soon, the process itself, with deep-pocketed contenders on both sides, has been a boon.

Net neutrality is of worldwide relevance, though this is sometimes not understood. A French communications minister reportedly argued that it was not an issue in Europe because of its more plentiful broadband. But actually,

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(\*) This article was previously presented as a column in *Financial Times Online*, NOAM, Eli, "A Third Way for Net Neutrality," August 29, 2006; and as the discussion paper NOAM, Eli, "Better than Net Neutrality," Telecommunications Policy Research Conference 2006., also given at the annual meeting of the American Economic Association, January 2007.

the problem is more acute in countries where there is only one serious avenue for broadband - the telecom pipe - without a well-developed cable broadband system, which is the case in several of the larger European countries, as well as Japan and in the developing world. The access to a single pipe and protection from its power without creating a regulatory system for the ages (this is not clear) then becomes still more important. It is therefore necessary to create the ability for all service providers, through assuring them "unbundled" network elements from the access monopolies. But even with such regulatory arrangements, conflicts have erupted (ANDRIYCHUK, 2010; MARDSEN, 2009). In consequence, the Netherlands became in 2011 the first European country to institute net neutrality regulations.

Given the high profile of the political debate, it is astonishing to realize that it is based on wrong premises, and therefore reaches the wrong conclusions about remedies. Part of the problem is the fuzzy terminology in which various kinds of providers and ISPs lurk about with constantly shifting meanings, so that conceptually the analysis becomes muddled. The task of the article is to identify this problem, and to find the correct solution to the problem addressed by the proponents of net-neutrality, while factoring in their critics' perspective, too.

The debate has been framed as one of monopolistic network incumbents, in particular the incumbent phone companies, exercising gatekeeper and technical control over the numerous users of the internet and their providers of content and applications. Therefore, regulation has to assure access and non-discrimination over the incumbents' networks.

This is at once too much and not enough of a remedy.

- The gatekeeper power is largely one of the last (or first) kilometer near the end-user, not of the entire network (from the end-user to a neighborhood node or nearby central office). It is this segment that deserves to be checked for openness, not the entire network.<sup>1</sup>
- On the other hand, the problem of that last kilometer is fundamentally serious insofar as competition will not solve it. Thus, whether the last kilometer will be offered by a Goliath or a David will make no difference to

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<sup>1</sup> For wireless internet data traffic, the "backhaul" provided to rival mobile companies from their cell sites to the core of their network is also a bottleneck.

the basic problem. Therefore, the solution needs to be different from the non-discrimination provisions sought by the proponents of net neutrality.

- The distributional problem, while framed as a struggle between network providers and content/applications providers, is just as much a re-distribution between different classes of end-users - light users and heavy users, with the latter gaining economically from net neutrality.

The cleanest and least regulation-laden solution to the problem identified by net neutrality is therefore the following:

To give full last-mile responsibility on payment and content to the end-users. They would lease or own that last segment, like they already do for their inside wiring. They determine what quality level they desire to get. They determine what content and applications packets will run over it.

In contrast, the providers of the last kilometer - which can be incumbents and independents - have no control over what runs over that segment, and they cannot charge content/applications providers for the termination of packets over the last kilometer.

Infrastructure providers, being largely free on the intermediate parts of their networks (excepting the last mile) have therefore the incentives of competition and price flexibility to upgrade their networks. For the last mile, where subscribers choose network quality, the incentives for upgrade are those of competition, plus potentially a subsidization.

## ■ The context

It's been said that each generation believes to have invented sex. The same might be said for media regulation. There is nothing especially new about its recent round - net-neutrality - as a conceptual issue, or in terms of its policy options, except for the terminology. In the most general form, societal control over media has been around, in one way or another, since our stone age ancestors danced around the fire. And the pattern has historically followed similar paths - an early and brief wildcatting stage of a new medium, left free to its own devices; a second stage of backlash as a reaction to real or feared problems of private control, with an assertion of state control; and a third stage of a loosening of such controls when their cost became evident while less restrictive alternatives became available.

What these dynamics have in common is that they are policy responses to market power, which is based on the underlying economics, and that these economics are in turn affected by the underlying technology. Change the technology, and its associated economics will adjust, and the rules will therefore change, too.

Today, we observe the same dynamics for the internet. After an early wildcatter stage<sup>2</sup> we have now entered into the backlash stage of governmental regulation. The battle over so-called net-neutrality is a major step in that direction.

Net-neutrality is like an inkblot into which people project their fears and hopes. There are at least ten different meanings in which the term is used:

- no different quality grades for internet service,
- no price discrimination among content providers,
- no charges to the providers for transmitting their content,
- no monopoly prices charged to content and applications providers,
- no discrimination on content providers who compete with the carriers' own content,
- separation of conduit and content,
- separation of layers,
- standardization of protocols,
- no selectivity by the carriers over content they transmit,
- no blocking of the access of users to some websites.

The latter two issues are by far the most important to society since they affect speech, culture, and politics. It is easy to agree to them (though some carrier companies' have made a First Amendment argument in the opposite direction, arguing that they were being curtailed in their speech rights). Therefore, proponents of net neutrality tend to stress the speech rights and latch on to them their other concerns which are more in the nature of an economic dogfight among companies.

Both sides have considerable market power - the carriers over the pipes, and several of the internet companies over major instrumentalities. Most people have only one or two meaningful options for broadband infrastructure connectivity, but the same can also be said for search engines, whose proprietary selection and priority system governs access into the world of information.

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<sup>2</sup> This stage followed an even earlier state-initiated industrial policy stage.

In academia the debate has spawned a cottage industry (LEHR, PEHA & WILKIE, 2007; MARCUS, ELIXMANN & CARTER, 2008; SINGER & LITAN, 2007). On the one side are the proponents of the view that more regulation will be counterproductive (SINGER & LITAN, 2007; LESSIG, 2001, 2002; MAY, 2007; SIDAK, 2010; SPULBER & YOO, 2008; YOO, 2005, 2010). Many tend to be economists. On the other side are similarly committed academics, often from law schools, championing openness and access (FRIEDEN, 2010; ROYCROFT, 2006; SCHEWICK, 2010; WU, 2003, WU & YOO, 2007).

## ■ Why is this happening?

As mentioned, if one changes the technology and its associated economics, and the rules will change, too. What is remarkable about the present internet is that it is in the midst of two opposite and divergent technology trends in the value chain. On the one hand, scale economies are rising for transmission and infrastructure; and on the other hand, the scale economies for many electronic applications (though not for some of the most central ones) are declining. The tectonic shearing of these industry sectors as they move in opposite directions leads to the eruptions and quakes over their relation and the rules that govern it.

It used to be expensive to create an infrastructure network, and economies of scale and network effects were such that people spoke of a natural monopoly. And thus there was only one network. And since it was considered an essential facility, access to it had to be protected, by requirements of "common carriage" (CC) on the network operator.

By the 1980s, it became cheaper to provide a telecom network, but the positive network externalities were of a magnitude that the new entrants needed access to the existing user base. All battles of American telecom liberalization were then around the non-discriminatory access (NOAM, 2001).

But this competition, I predicted almost 20 years ago (NOAM, 1994b), would lead to the erosion of common carriage in favor of "private carriage." And it did so, indeed. The CCs argued that they should get the same non-CC rules, just like their rivals, cable TV and others, and that scarcity was over. Accepting that argument, the FCC started to treat them like non-CCs.

But this was not the end of the story. More recently, increasing bandwidth usage due to broadband internet led to fiber-based networks on the local access level. Huge capital outlays were needed. Verizon claimed the largest capital expenditure of any company in the world due to its fiber investments. Fixed costs are up, marginal costs down, and economies of scale are rising again for networks.

But at the same time, the economies of scale and entry barriers for content production and for new applications declined. So we now have hugely more content and applications providers facing fewer pipes, and without the common carrier guarantees of access and non-discrimination.

In fact, the scarcity is such that the carriers are now making the arguments that they should not be common carriers so that they could be more profitable and afford the investments needed. In other words, whereas before it was the abundance of networks that was their argument against CC, now it is their scarcity.

## ■ Europe's direction: functional separation and unbundling

Market power of infrastructure companies is not particular to the U.S. alone. In Europe it has led to a focused attention on functional separation (FS). The idea, championed in the UK (Ofcom, 2006), later in Brussels<sup>3</sup>, is to segment the incumbent firm into an infrastructure wholesaler and a service retailer. The wholesale infrastructure firm must provide service to the various retailers in a non-discriminatory fashion to their own retailer. A variant to the separation is to require the infrastructure wholesale to offer its separated network elements to the retailers on an "unbundled" and non-discriminatory (with the network firm's own retail operations) basis. This is known as the UNE (unbundled network elements) approach (BARANES & BOURREAU, 2007; DIPPON & WARE, 2010; GABELMANN, 2001; OECD, 2003; SUTHERLAND, 2007). The FS and UNE approaches are not directly aimed at the same internet issue debated in America, but the issues are related (HAUSLADEN & WALLSTEN, 2009; WILLIAMSON, 2011). FS and UNE deal with the lower levels of the network layer hierarchy, transmission

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<sup>3</sup> For example, Commission of the European Communities, "2002/20/EC on the authorization of electronic communications networks and services", Brussels, November 13, 2007.

(wholesale) and middle level services riding on them. But they do not quite reach the upper level applications such as content providers who ride, in turn, on the services.

FS and UNE aim to protect service providers against discrimination by the network provider in favor of its own applications. (Actually, to do so one would have to do a full AT&T- style divestiture to eliminate incentives within the same company, however structured, but that would take more political courage.)

But functional separation and unbundling do not prevent, by themselves, price or quality discrimination by network provider among unrelated services. They similarly do not prevent, by themselves,

- the blocking of unpopular content,
- the blocking of applications that use up a lot of bandwidth capacity,
- the charging of monopolistic prices, by the infrastructure providers,
- the charging of 'squeeze' prices,
- the charging of monopolistic termination prices by service providers for inbound traffic.

Therefore, functional separation and unbundling still require other forms of regulation.

In the U.S., various forms of separation have been tried for many years—functional, unbundled, accounting, structural, corporate. But these separations, inherently static, could not withstand the dynamic forces of a rapidly changing technology and business environment. And in any event, the European FS and UNE do not solve the problem for internet content providers against discrimination and blockage by the independent service providers. It is incorrect to believe that an independent service provider has less incentives to discriminate against content providers. This will be developed further below in the discussion of termination.

## ■ Net Neutrality

In America, as mentioned, the separations policy had been tried in various variations. But a second major approach has been that of assuring access in a non-discriminatory way, along the tradition of common carriage. Most battles of American liberalization of telecommunications have been over access issues. Today, the providers of internet content and applications

seek a policy of "net neutrality." While its meaning is fuzzy the central issue is clear: the power of the delivery infrastructure providers - mostly telecom or cable companies - to select, price, or differentiate among the internet information streams that pass through their pipes on the way to the end-users, as well as partly back to them, or among end-users ( see Graph 1 below). Fearing such gatekeeping power, internet content and applications providers, as well as traditional media companies, have banded together. They seek protection from the network companies' power over access prices; over quality, price discrimination, favorable treatment of their own subsidiaries, etc.

It must be understood how much a change in attitude this appeal to government regulation is. Barely a decade ago, the internet's chief ideologues declared in their 1996 Declaration of Independence of Cyberspace:

"Governments of the Industrial World, you weary giants of flesh and steel...On behalf of the future, I ask you of the past to leave us alone. You are not welcome among us. You have no sovereignty where we gather." (BARLOW, 1996).

But a few years later, the internet community is seeking, under the heading of net neutrality, the policy that dares not speak its name - telecom common carrier regulation - the body of regulation that deals with access, price discrimination, gate keeping, vertical squeeze, and many of just the problems that internet providers have encountered.

Internet libertarians have belittled telecom regulation as part and parcel of old fashioned telephone networks, and a reflection of dinosaur phone companies and co-opted regulators. But just a few years later, the internet's advocates seek governmental protections from the powers of the telecom and cable companies, powers over pricing, quality, discrimination, access, content, favoritism for own subsidiaries, etc. They seek an opening of incumbent networks through unbundled network elements and re-bundled platforms, line sharing of frequencies over local networks, etc. And who should institute these protections? The same derided old-fashioned telecom regulators.

There is nothing wrong with these goals. But they are not exactly libertarian. Yet they are not hypocritical, either. They just reflect the discovery of the reality of market power and its implication to regulatory rules and institutions. The reasons are not those of conspiracy or of cooptation of regulators but of economies of scale. The economics of networks are

characterized by high fixed costs and low marginal costs. This favors large providers. In competition, prices are pushed onwards to marginal costs, which are too low for most firms to survive, ergo consolidation takes place. It might not be quite a "natural monopoly" but probably a "natural oligopoly". And this leads to some form of "natural regulation".

## ■ The Re-creation of the regulated common carrier

The content and applications providers want to have the infrastructure pipes be prevented from either:

- charging *any* price,
- or, charging a differentiated price or quality level that can discriminate among them,
- or, charging a single monopolistic price.

The problem with any of these is that they invariably lead to a complex and traditional common carrier regulation of prices and quality. For example, what exactly is meant by "non-discrimination"? In practice, this is not an easy question. There are applications that are highly capacity intensive; others that are highly time sensitive; others that require great security; etc. Thus, differentiations are unavoidable. It would require definitions of price, quality, and performance. It would require definitions of what constitutes discrimination. And it would require an enforcement of these standards through measurement, adjudication, and litigation. Similarly, if net-neutrality means protection against monopoly pricing, not just against unequal pricing, then one would have to establish standards of cost, profits, and quality against which this could be evaluated. It gets still more complex with a net-neutrality that incorporates separation of conduit and content, or a separation of layers, or a uniformity of protocols (see the earlier definition list of net neutrality). None of this makes NN wrong. But it is not a policy and process that can be gotten on the cheap.

Non-discrimination and absence of monopoly pricing are central elements in common carriage regulation. Common carriage is a system that goes back, in variations, to Roman days. Its inherent conflicts must be understood (NOAM, 2001). The first is that it is difficult to do common carriage only partially, for some types of companies, services, or industries, while having them compete with companies that are not under the same obligations. The reason is that in a head-to-head competition, companies

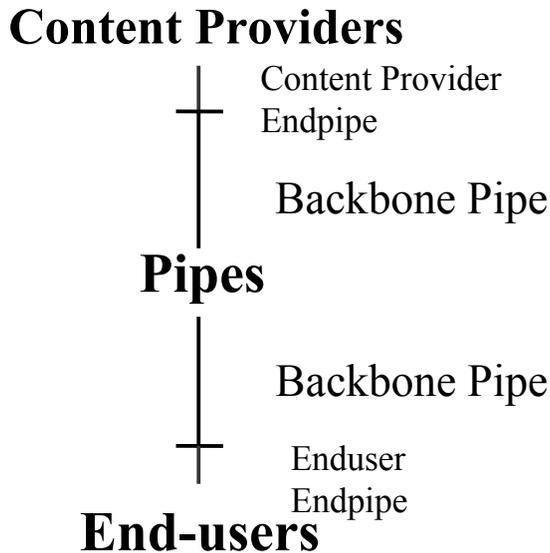
without such obligations would outperform those with such obligations (NOAM, 1994a). Thus, one should not institute access rules if one is not prepared to extend them widely.

There is a long and painful history here, and most proponents seem to be only partly familiar with it, so they can be forgiven for denying the inexorable logic of price constraints working themselves out institutionally. Many an advocate for utility-style regulation is a libertarian who got mugged by market power.

And this is not surprising. Telecom regulation, though derided as "legacy", had evolved for a reason. If regulate we must to institute a set of societal goals, then telecom regulation is really quite sophisticated a tool relative to those of other industries. Take the concept of forward looking incremental cost pricing for unbundled network elements. Neither aviation, pharmacological drugs, environmental controls, rail transportation, nor electric utilities have anything that comes close in terms of economic sophistication and institutional complexity. This is not to say that it is a "better" regulation, just a more complicated one, dealing with numerous factors, and conducted on an economic level of significant expertise.

Perhaps the best way to analyze the issues is to view it as a chain involving three parties (see Graph 1): the providers of internet content and applications, such as Google, Yahoo, HBO, or Vonage; the end-users of that content (some of whom are also content providers, at the same time); and the electronic pipes that connect between them and transport the information packets, such as Comcast and AT&T. These pipes come in two different sections: 'end pipes' that reach individual end-users, and 'backbone pipes' that constitute the local and national network system and serve numerous users simultaneously. It is important to distinguish between those two different pipes. There are also two types of endpipes: those connecting the end-user, and those connecting the content provider. The latter requires vastly more bandwidth, and its pipes are consequently much bigger, and a more tempting business for endpipe providers (we avoid the term "ISP" because it is vague, non-intuitive, inconsistently applied, and slippery whether it is a service or part of the infrastructure).

The question then is what kind of control the pipes can exercise over the content, prices, and quality of information packets that are sent by providers to end-users, and over the access of end-users to the providers.



## ■ The impact of bottleneck

Rational economic behavior would lead the pipes, if they are unconstrained by competition or regulation

- to charge monopoly prices to the content and applications providers as they send out packets,
- to hold auctions among competing applications providers,
- to block or retard competing offerings, such as VOIP,
- to impose termination fees.

This would then make the internet applications not free anymore, since the content providers would have to charge, or to be more dependent on advertising. It leads to a slowing of innovative small firms. And it would create incentives for vertical integration through an expansion of the bottlenecks downstream into applications and content.

These pipes have a long history of monopolistic pricing and restrictions of access. Economic maximization would lead them to charge content and applications providers as they send out packets, even when these are requested by the end-users. Indeed, the pipes are likely to entice end-users with low subscription fees, and then hit the providers with high charges,

because they have other ways to reach a particular end-user after he has made his choice of a last-mile pipe. They will then have to charge those consumers for their use. As a result the internet Internet ceases being mostly free to end-users beyond their monthly connectivity fee. Instead, they will often have to pay each time they click on a website, thereby reducing the use and exploration of the internetInternet.

The basic market power problem is that left to itself, the end-pipe provider will charge a monopoly price for terminating traffic. Competition for the end-user then is, in effect, a competition for the right to charge that monopoly price. This is true whether the endpipe provider is an incumbent or an independent. With competition in the endpipe market the monopoly rent would accrue to the end-user rather than to the endpipe. But that would not be much of a comfort to the content provider. They would still be charged monopoly prices by the winning bidder for the endpipe. (There is one benefit to the content provider: low endpipe prices due to competition increase penetration and hence potential usage for their content and applications).

## ■ Re-Distribution

It is a mistake to believe that termination charges are just a shifting of cost among network and applications providers and hence a wash for the end-user. It is actually more of a shift of cost among end-users. One needs to understand this to understand the distributional economics - and sociology - of this debate. When applications providers are charged for termination, which would be based on a usage base such as minutes or packets or some other quantity measure, they incur a marginal cost for sending packets to the end-user, and will charge end-users accordingly. This moves the combined pricing for the end-user (endpipe plus content provider price) from flat to a usage based pricing. Or, more specifically, to a two-part pricing, a flat base fee plus a usage-based portion. From an economic and social perspective then, i.e. without consideration for the importance of free flow of information, one might argue that this shift is even beneficial:

- It lowers end-user price and therefore increases penetration and therefore network effects.
- It shifts a flat pricing to a marginal cost pricing, which is economically more efficient by discouraging wasteful use of network resources.

- It lowers prices for low users, and results in a higher price for high users.

As one would expect, heavy internet users are likely to have most at stake, and be the most articulate and vocal, when it comes to flat-rate pricing. But it is not obvious that for a large number of low users the shift to usage pricing would not be advantageous.

Anyone who remembers the political economy of telecom price regulation would appreciate the irony: flat rate access pricing for long distance carriers into the local network in telecommunications was - and is - strongly opposed by consumer advocates as anti-consumer, because it ends up burdening low users and benefiting heavy users. Now, for internet applications, some of the same organizations support a flat rate system that would have the same effect.

### ■ A 3<sup>rd</sup> way: End-user Sovereignty

We have seen that a laissez-faire approach leads to monopoly behavior, and regulated non-discrimination leads to a utility-style common carrier regulation, with negative impact on investment incentives. In that dilemma of two unhappy alternatives there is fortunately a third way. I call it *End-user Sovereignty*.

One needs to break down the market power problem into its components. Not all of the network needs to be regulated for neutrality. But some of the network should not be left to free to engage in gatekeeping. Let us therefore differentiate between two parts of networks:

#### *Backbone-Pipes*

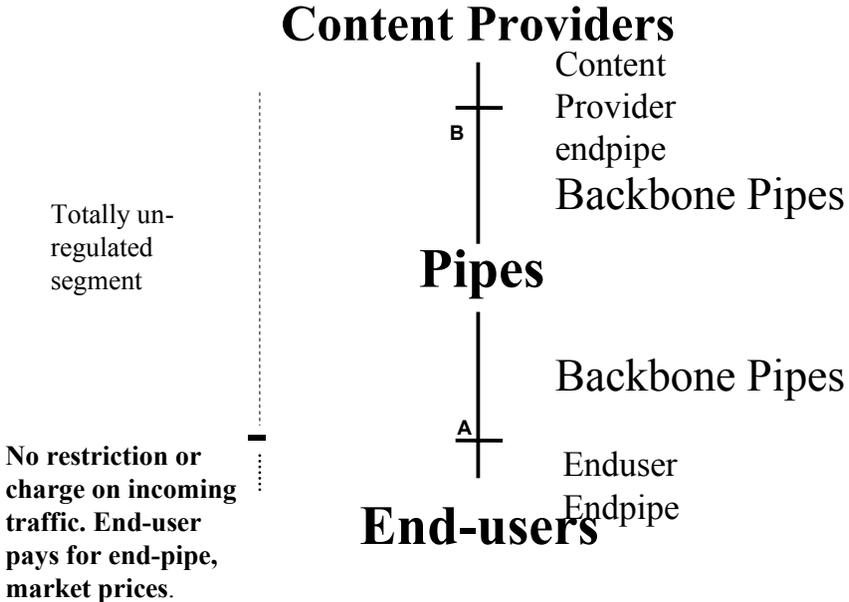
For those pipes, competition exists, and content and applications providers could find ways to bypass restrictive backbone-pipes, directly or through resellers, as long as they could access the last-mile pipes. The following principles would apply:

- Backbone Pipes are free in their pricing and quality offerings.
- Backbone Pipes cannot limit resale.

- Where pipes discriminate in favor of their own content or applications provision and at the same time also hold market power, they would be subject to fast-track regulatory and antitrust laws.

*End-user pipes*

This is the traditional core of market power for the pipes, typically known as 'access'. Right now, at the end-user level, there are usually at most two major pipes - the telecom and the cable pipes - plus several lower-speed mobile wireless. Several other options are potential rather than real (NOAM, 2006, and forthcoming). The major pipes have significant market power towards the end-users, and even more so towards content providers, for whom they are the only way to access an end-user, as long as the end-user has only one major pipe to the home. On the other hand, content providers get their own endpipes in a competitive market, and for them the principles of unregulated backbone pipes apply also. Where such competition does not exist, they would be subject to the symmetrical principles for end-user endpipes which now follow:



- End-users own or lease the endpipes. They do not charge termination fees to content providers for sending them packets.
- Packets from providers and anyone else can access the endpipes at their initial point (the last node or the central office).

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- Endpipe providers can offer various packages of quality and price to end-users and these are free to choose a quality or price package offered, and to access any lawful content and applications provider, and to connect any device. The corollaries are:
    - Endpipe providers can offer specialized (non-public internet) capacity;
    - The allocation of the capacity of the endpipe among the public internet and the private internet is chosen by the end-user.
  - Where there is no competition in end-user pipes, prices may have to be regulated, perhaps with the yardstick of the prices in competitive markets.

In addition, for the end-user endpipes, public policy should be to provide incentives to increase the number of pipes. But, as has been discussed, the creation of such choice for the end-user will not resolve the termination issue. To do that, end-users would have to sign up with multiple endpipes so that competition would be generated in termination charges. It is not clear what the incentives would be for the consumer to do so: it adds the subscription cost of additional service providers, plus it will make each of them more expensive when they cannot charge high termination prices.

This "End-user Sovereignty" system is only minimally intrusive in that it basically only requires the free (in both senses of the word) access of packets into the last-mile termination pipe, from whatever backbone-pipe the content provider picks. No further regulation is necessary, competitive forces can arise, and pipes and content providers are otherwise unrestricted. The problem is the monopoly aspect of the consumer endpipe. Even in endpipe competition, the winner for the consumer becomes the termination monopolist.

The key is therefore to shift the pricing for the endpipe to the end-user, and away from the termination provider. In other words, to a creation of a system similar to that of the RPP (receiving party pays) system, or to a bill-and-keep system (DEGRABA, 2002). Under such a system, the endpipe carrier cannot charge for termination, and must transport the packets delivered into the endpipe on a bill-and-keep basis, i.e., with no charge to the network that delivers the packets. Responsibility for the endpipe payment is entirely from the end-user itself. The end-user either owns the endpipe, just like they do today for the inside - premises wiring in their home or office, probably with a maintenance contract, or they rent it from an endpipe provider, who could be either a traditional telecom carrier, or a cable company, a small local provider, a housing association, etc. If some end-users desired a particular grade of quality or capacity, they would

buy/rent it. With such a system, the endpipe provider has no economic or other gatekeeper control over termination any more than a car manufacturer has over where their cars are driven to. This should resolve the fear of the content and applications providers that they might be charged, blocked, or required to bid against each other. It removes the fear for the free-speech aspects of gatekeeper power by the small number of networks.

Thus, this system is open in terms of communications flow, efficient in terms of economics, usually competitive, lightly regulated, and without a complex regulatory apparatus.

## ■ Distributional implications

What are the drawbacks? The system might not be easy to implement politically. The reason is that while it bans termination charges, it makes end-users pay, in contrast for to a system under which endpipes give end-users discounts in order to gain the right to charge and over-charge incoming traffic. To ban, in effect, such discounts, is not a popular matter. Furthermore, it is not neutral across the income and educational scale. While shifting cost on the content providers from the endpipes might seem to be a wash, it is not, as has been analyzed above. It will burden heavy users more than light users.

Thus, it will put consumer advocates in the position of having to decide what their priorities are: free flow of communications, or cheap communications for the weaker segment of consumers. The need for a choice might be denied, but it exists nevertheless.

A second problem with a system of End-user Sovereignty is the magnitude of the payment from end-users. Even if monopoly pricing would not be an issue, the last segment of a network has always been particularly expensive because it is largely unshared. To deal with this issue, a variety of cross-subsidies are implemented which transfer revenues from lower average cost segments - such as the backbone pipes - to the endpipes. Many of these cross-subsidies are invisible, within a single network company. But now, the end-user pipe is separately paid for from the backbone pipe. The price might therefore be high, especially in low density areas. But nothing precludes the maintenance of a subsidy system. One solution could be a percentage surcharge on all communications bills, to fund in a targeted way those end-users and areas that merit support. The

support most likely would be through vouchers to users, and high-cost payments to rural infrastructure providers.

Retail prices can still be kept through the same methods as before - price caps, most particularly, or some average cost or marginal cost based systems. This is not changed by the ES system; only the bundled price of endpipe and backbone pipe is changed.

## ■ Upgrade investments

Infrastructure firms have argued strenuously that the restrictions of Network Neutrality would lower their ability to invest, and that, given the public good aspects of networks, this would be socially harmful. What would be the effect of End-user Sovereignty on the upgrade investment of pipe providers? Again, the question must be disaggregated. For the backbone pipe and the content provider endpipe segments of networks, the ES system would leave network providers with near full pricing flexibility. The constraint is competition, but that is not something that can be a credible basis for complaints. There would be, of course, periods in which such competition would drive profits down and some companies out of the market. But on the whole the competition rather than monopoly is likely to force pipe providers to accelerate investments in order not to lose out to others. The answer is harder for investment in end-user endpipes. Upgrading this last kilometer is both expensive and low-marginal revenue relative to user, since it tends to be unshared. The ES system further opens the endpipe market to companies, including to small local firms that could provide the local wire, fiber, or wireless links without aiming to become a national integrated network. This should increase investments to keep up with competitors, but also lower the profitability of investments. Here, too, one would expect on the supply side some cycles of investment, over-investment, price pressures, and consolidation. On the demand side, a naked system of end-user pricing will be unfavorable. It eliminates the contribution of termination charges that can lower end-user prices. And it may reduce the cross-subsidy from the backbone pipe that exists in the vertically integrated network. Therefore, where one wishes to maintain a price that does not discourage end-users, a similar subsidy mechanism to endpipes is likely to emerge which provides some cross-subsidies from backbones to endpipes.

Competition and substantial flexibility should accelerate investments, though with boom-bust cycles, and without the deep pockets from monopoly rents. On the other hand, end-user endpipes, in the absence of restoration of cross-subsidy system, would dampen end-user demand. Thus, we are left with an ambiguous answer to the question on the impact of ES on upgrade investment. But in comparison to Network Neutrality, Enduser Sovereignty is more pro-investment, in particularly in the backbone segment.

## ■ Conclusion

An End-user Sovereignty system combines some elements from the European approach of functional separation and unbundling with the America-based push for neutral network access and non-discrimination of content and applications.

To deal with the exercise of market power in the upper layers of services still requires protection since, as we argued, competition for the endpipe will not create non-monopolistic termination. This arrangement, by separating the last-mile pipe where potential problems exist, from the middle-pipes, where they do not, provides both openness and minimal intervention. It responds to both sides' legitimate problems, not as a 'divide-the-baby-in-half' compromise, but as a genuinely better system.

But if the lessons of past regulatory dynamics of media that was were discussed at the beginning of this article is are a guide, then we are first headed for the stage of a net-neutrality regulation that will overshoot its target by disregarding its cost in terms of complex process. In time, there will be a loosening and the adoption of some form of End-user Sovereignty. It would be productive if we could leapfrog the previous stage. But the combatants in Washington are over-argueing their case, and this debate will go on. But after a while people will step back and recognize that there is merit to both sides - the monopoly power here and the investment and flexibility arguments there; that the net-neutrality process would have grown unwieldy; and that a better system is possible. And this will lead to the next round of analysis and debate, and hopefully to End-user Sovereignty.

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