

Reasonable Network Management: Best Practices for Network Neutrality

An Industry Whitepaper

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Executive Summary

Massive investments in Internet infrastructure by communications service providers (CSPs) have enabled consumer Internet traffic to grow at 40% per year in mature markets, and at even higher rates in developing markets.

Yet, despite these efforts, capacity bottlenecks still appear. The simple fact is that to keep Internet access affordable, infrastructure must be shared in an oversubscription model.

No amount of capacity expansion can completely eliminate congestion, so CSPs must find additional means of preserving fair access and high quality of experience for their subscribers. These solutions are broadly referred to as traffic optimization, a subset of which is called traffic management.

Increased regulation, broadly referred to as Network Neutrality, places requirements on how CSPs can manage their networks, and often place disclosure requirements around the management techniques.

This paper explains how to achieve the concurrent goals of providing sustainable high-speed data service while complying with network neutrality guidelines and principles.

By adhering to five key principles, CSPs can continue to accommodate enormous data growth while employing reasonable traffic management techniques to protect the network's ability to deliver high-quality subscriber services.

Introduction to Network Neutrality in Policy Control

Network Neutrality lacks a consistent definition globally, but one key aspect of it tries to address how communications service providers (CSPs) can manage traffic in their network. Regulations in Canada, the United States, and other jurisdictions have generally accepted the notion of “reasonable network management” as part of the Network Neutrality.

However, whether official regulations exist or not, wherever the concept of Network Neutrality exists in the public mind, CSPs seek to establish policies that can stand up to public and regulatory scrutiny.

Through research, public commentary, and the socialization of Network Neutrality issues with such entities as the Canadian Radio-television and Telecommunications Commission (CRTC)¹ and the Federal Communications Commission (FCC)² in the United States, and the Body of European Regulators of Electronic Communications (BEREC) in Europe, Sandvine is in a good position to provide principles and best practices for network management that align with global standards (whether official or not) and directly relate to public concerns about Network Neutrality.³

¹ CRTC decision rules are located [here](#).

² FCC guidelines are located [here](#).

³ You can learn more about Sandvine’s activities with respect to Network Neutrality, including links to many of our submissions and our public commentary, at this page: <https://www.sandvine.com/trends/network-neutrality.html>

Best Practices

To be successful, reasonable network management to address problems such as congestion must aim for precision and success in terms of the desired technical effect. It must do so by enhancing subscriber quality of experience (QoE) to stay ahead of competitive forces, and also without falling afoul of public perception and official regulation. This is a tough set of bounds to operate within and, although there are voices that will always object to any kind of traffic management, success can be achieved by ensuring solutions adhere to the following best practices:

- Legitimate and demonstrable technical need
- Narrow-tailoring in terms of the stated technical goal of a traffic management practice
- Proportional and reasonable effect in achieving the goal
- Transparent disclosure
- Auditable and demonstrable

Legitimate and Demonstrable Technical Need

The operator must have a legitimate and demonstrable technical need for the network management practice. The architectural strengths and weakness of various network access types provide the majority of the technical needs for network management.

A network management practice that is unreasonable in one access network may well be reasonable in another. This context is crucial. Solutions fair best when they directly address the problem of a legitimate network problem such as congestion, and do so with proportional precision.

To be successful, a traffic management practice must be described in such a way that both the technical need and the practice are clear and the traffic management practice seeks only to address this need and nothing more.

Narrowly-Tailored

All networks have variations in usage patterns, whether by time of day, by geography, by user demographics or other factors. As a consequence, oversubscription and QoE are non-uniform across the network.

A properly constructed network management plan takes this into account, and focuses as narrowly as possible on the problem to be solved. It does not try to force a one-size-fits-all solution into all areas at all times. When applied correctly, management of traffic during times of congestion is a win-win as the majority of subscribers continue to have a good quality QoE and the access network lifetime is extended, allowing network investments to be made in other areas of need.

In an access network environment, there are several areas of ‘narrowly-tailored’ that might be technically considered for addressing subscribers who are causing disproportionate congestion. These include:

- Network type (DOCSIS 3.0, UMTS, DSL, LTE, WiFi, Satellite, etc.)
- How access nodes and links interact
- Subscriber density per access node (QAM, DSLAM, Mobile Cell)
- Subscriber demographics per access node
- Backhaul network capacity
- Unforeseeable events

A reasonable network management practice takes these factors, and more, into account. It applies itself differently, or not at all, depending on the conditions that are currently present. For example, a network management practice might be self-tuning, and could disable management when no congestion is present. In a cable network it might operate differently when congestion is present on a single user, versus on a single RF channel, versus on a bonded set of RF channels, versus on the CMTS backhaul uplink. It might detect congestion passively by setting a maximum bandwidth threshold per node and monitoring the bandwidth usage, or it might do so actively by measuring the real-time latency in the access network and triggering according to a latency threshold attached to subscriber quality of experience.

A successful traffic management practice will narrowly-tailor itself to the situation at hand at the time it is needed. It will not apply in a broad fashion across the broad average of a network.

Proportional and Reasonable Effect

The network management policy needs to take into account the concept of proportional effect and response. A ‘reasonableness’ test helps define the acceptability of network management. This test stems from the common-law concept of ‘what would a typical person agree is reasonable’, and is therefore somewhat subjective in definition. Some precision of what is reasonable can be achieved through the best practice of seeking proportionality in term so the final outcome of a policy seeking to address a problem such as network congestion.

It has been proven that long-term heavy users are not the contributors to congestion when it occurs, which makes targeting long-term heavy users during times of congestion out of proportion, inaccurate, and therefore not reasonable. Similarly, it would be considered unreasonable by most to take a subscriber causing 15% of the congestion on a network and manage their bandwidth to 1% of peak rate for all time. However, a reasonable argument for fair distribution can be made to reduce the priority of traffic of the top twenty-percentile of bandwidth users during times of congestion, which as a group typically constitute only 5% of subscribers but consume more than half the network’s bandwidth at a given point in time. In reducing the traffic priority of this ever-changing minority during times of congestion the latency, and by extension QoE, of the other 95% remains good.

Reasonableness can be defined through contract, which means it relates directly to the best practice of transparent disclosure described below. If typical users, understanding the disclosed network management policies in use, contract for the service, the policy must be reasonable by definition. Reasonable is defined entirely in the frame of reference of the end-user, the customer of the service provider.

Transparent Disclosure

Transparency is a challenging concept. The subtle technical nuances of networks (latency, loss, jitter, shared-access, etc.) are difficult to describe in simple enough terms for the average layperson. Analogies, although helpful to form a basis, rapidly become inappropriate as they diverge from the original problem. Network management practices evolve over time, and new technologies have seen the emergence of traffic management practices based on deep packet inspection (DPI). Since we are relying on transparency as a means of supporting reasonableness, what’s relevant to disclose is any aspect that would affect the actions or perceptions of the typical consumer.

The operator must make the material information publicly available to allow understanding of the network management policy by those impacted by it. The disclosure should be sufficient for a consumer to form an informed opinion on whether the practice will affect them, which applications

might be affected, when they might be affected, and what the impact might be, including impact to speed, latency and general experience. Similarly, subscribers should be notified in advance of any planned changes to network management practices.

Disclosure might take many concurrent forms. The most popular include network management FAQs, notices included in billing material, acceptable use policies, terms of service, etc.⁴

Auditable and Demonstrable

Owing to the public scrutiny of capital investment in networks, and network management policies, it becomes important for a CSP to demonstrate that the above criteria were indeed met.

On audit, a service provider should be able to provide the following:

1. Justification of the technical need that caused the creation of the network management policy
2. What affect the policy had on the user experience
3. How they have disclosed their policy to the end-user
4. How the policy took into account network and time variances (i.e., how it was tailored)

In addition, the audit should be able to demonstrate the above were met using technical results. These results might include information on the user experience for the typical user for typical locations in the network.

⁴ See examples from [Cox Communication](#) and [Virgin Media](#).

Conclusions

Network management policies based on traffic management must be technically legitimate, narrowly tailored, proportional and reasonable, transparently disclosed and auditable.

Reasonable network management requires disclosure of the policy in such a way that the typical user can understand the impact to them, and reasonableness is framed entirely from the end-user perspective.

Access-agnostic network policy control is required to create a network management practice that spans multiple devices, and multiple access technologies. The network management practice must take into account the specific conditions of the access technology.

Strong reporting and business intelligence is required to be coupled to the network management practice to support auditing and the understanding of demand, capacity, and user experience.

As a typical service provider, this may seem like a minefield of requirements, but a few simple up front planning activities can make for a highly successful traffic management practice.

Summary of Best Practices for Network Management

| Best Practice | Criteria | Example |
|--|--|---|
| Legitimate and Demonstrable Technical need | The fielded solution must be shown to address something tangible that occurs as a problem in the network (simply seeking to arbitrarily reduce bandwidth consumption without stating a technical issue is not valid) | The network becomes frequently congested at various locations, affecting subscriber QoE, and the problem must be addressed |
| Narrowly-Tailored | Defining a policy that actually addresses the stated problem to be solved, and nothing more | If the stated goal is to manage congestion, then traffic should only be managed when congestion is present |
| Proportional and Reasonable Effect | Managing traffic to achieve a precision effect that ties directly to the stated goal (e.g., congestion management) | Managing the contributors to congestion during times of congestion Not managing long-term heavy users and claiming it reduces congestion |
| Transparent Disclosure | Making available full details of how a policy will affect the consumer experience so that they can make an informed choice | Online FAQs, direct mail, terms of conditions, fair use policies, etc. |
| Auditable and Demonstrable | A CSP must be able to clearly demonstrate to itself, regulators and the public that a solution meets the first three criteria above | Detailed reporting of the traffic management policy effects |

Related Resources

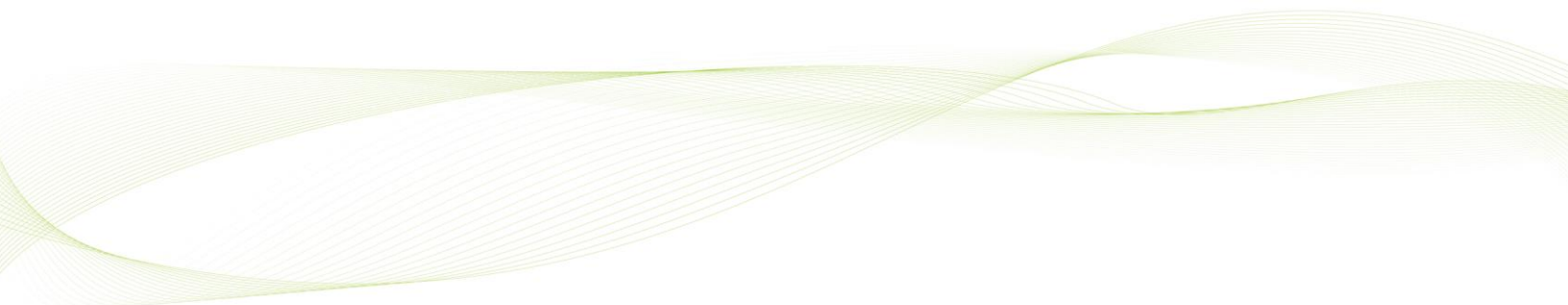
You might also find these resources useful:

- The Sandvine whitepaper [Network Congestion Management: Considerations and Techniques](#)
- The Sandvine technology showcase [The QualityGuard Congestion Response System](#)
- Also, Comcast describes their protocol-agnostic congestion management in RFC 6057, which is available online at <https://tools.ietf.org/html/rfc6057>

Invitation to Provide Feedback

Thank you for taking the time to read this whitepaper. We hope that you found it useful, and that it contributed to a greater understanding of reasonable network management and Network Neutrality in general.

If you have any feedback at all, then please get in touch with us at whitepapers@sandvine.com.



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Best Practices for Zero-Rating and Sponsored Data Plans under Net Neutrality

An Industry Whitepaper

Executive Summary

Innovative subscriber Internet services are rapidly emerging, globally. Many of these services rely on two techniques in particular (used either alone or in combination):

- Zero-rating, in which unlimited usage of certain applications or content is bundled 'for free' into data plans
- Sponsored data, in which a third party pays for certain data usage, like the Internet equivalent of a toll-free phone call

While many early innovations appeared in emerging markets, increasingly we see innovation in developed markets where Network Neutrality rules are well-defined or are very nearly finalized.

Over time, these rules will be tested to determine their more precise meaning.

This whitepaper proposes a set of best practices to guide communications service providers (CSPs) as they deploy innovative services, and explores real-world examples of zero-rating or sponsored data both to illustrate these best practices and to demonstrate how existing plans may be modified to lower the risk of Network Neutrality concerns.

Introduction

While penetration of Internet access is extremely high in developed countries, subscriber and revenue growth is flat. In fact, according to Ovum Telecoms' Media & Entertainment Outlook 2015, retail connectivity and VAS revenues in Western Europe are already slowing, and the trend is expected to continue.

Accordingly, communications service providers (CSPs) must look to grow by attracting new subscribers from competitors' networks. An increasingly important basis for such competition is the differentiation of Internet service offerings. Notably (from the perspective of many regulators), such differentiation also has the benefit of improving choice for Internet subscribers.

Another challenge facing CSPs is that the disruption of their traditional services by over-the-top (OTT) applications. For example:

- Skype, Vonage, FaceTime, WhatsApp, Viber, and other OTT communications services are replacing local and long distance voice services
- Netflix, Amazon, Hulu, HBO Go, BBC iPlayer and other OTT video streaming applications are replacing broadcast and pay television
- WhatsApp, WeChat, Viber, LINE, and other instant messaging services are replacing text messaging

This disruption is welcomed by consumers but is a challenge for CSPs. In the past, these traditional lines of business funded network improvements that sustained the delivery both of CSP branded services and the replacement OTT applications themselves. To fill this funding gap, new revenue sources are necessary, and service differentiation plays an important role.

Traditionally, Internet services were relatively simple: pay a fixed amount (pre- or post-paid) for a given access speed and, possibly, a data quota. The notion of service differentiation is relatively new, but the tools now exist to offer a wide variety of services that vary based on application, device, time of day, and a myriad of other factors—either considered alone or in combination. However, it's important to understand the impact of Network Neutrality, various concepts of which continue to become embedded in the regulations that cover CSPs' businesses globally.

Network Neutrality and Service Differentiation

Despite the common misconception, there isn't any universally accepted definition of Network Neutrality¹. For illustrative purposes, this paper focuses on what the rules actually say with respect to service differentiation in two influential jurisdictions where Net Neutrality rules are in place (or are about to be): the United States and the European Union.

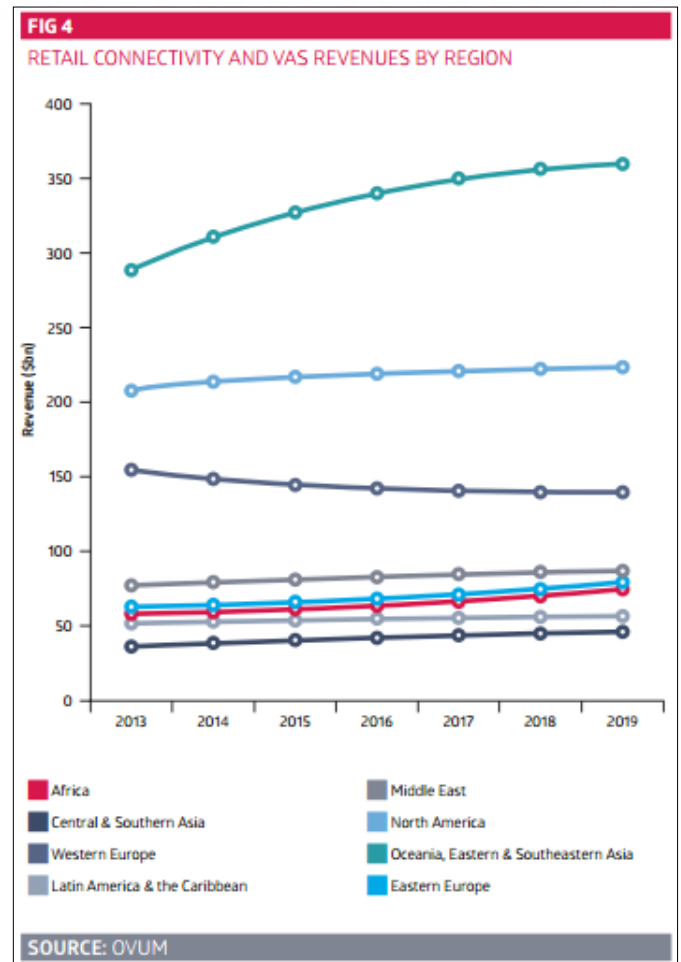


Figure 1: From the Ovum report on Telecoms, Media and Entertainment Outlook 2015

1. ...and we are not foolish or adventurous enough to try to suggest one here

Network Neutrality in the United States

In the United States, an order dated March 12th, 2015, finalized “Open Internet” rules; this order included three “bright line rules”:

1. **No Blocking.** *A person engaged in the provision of broadband Internet access service, insofar as such person is so engaged, shall not block lawful content, applications, services, or non-harmful devices, subject to reasonable network management².*
2. **No Throttling.** *A person engaged in the provision of broadband Internet access service, insofar as such person is so engaged, shall not impair or degrade lawful Internet traffic on the basis of Internet content, application, or service, or use of a non-harmful device, subject to reasonable network management.*
3. **No Paid Prioritization.** *A person engaged in the provision of broadband Internet access service, insofar as such person is so engaged, shall not engage in paid prioritization.*

Additionally, a “general conduct” rule—particularly relevant to service differentiation—states:

“Any person engaged in the provision of broadband Internet access service, insofar as such person is so engaged, shall not unreasonably interfere with or unreasonably disadvantage (i) end users’ ability to select, access, and use broadband Internet access service or the lawful Internet content, applications, services, or devices of their choice, or (ii) edge providers’ ability to make lawful content, applications, services, or devices available to end users. Reasonable network management shall not be considered a violation of this rule.”

According to the Open Internet order, the FCC will only formally opine on whether an Internet access plan violates its rules if someone files a complaint.

Network Neutrality in the European Union

In October 2015, the European Parliament approved a proposed Regulation concerning Net Neutrality and roaming in the EU, applicable to all Member States. The Net Neutrality rules will apply from April 2016 forward.

In the Regulation, there is language that (while slightly different) is also designed to protect users’ access to/ distribution of applications, services, and terminal equipment of their choice, similar to the *No Blocking* and *No Throttling* rules in the U.S., and to ensure that any prioritization is not based on commercial reasons (i.e., no paid prioritization). However, there does not appear to be an equivalent overarching rule similar to the “general conduct” rule in the U.S.

2. What is “reasonable network management”? You can learn about it in [Reasonable Network Management: Best Practices for Network Neutrality](#)

Recommended Best Practices

Based on Sandvine's extensive real-world experience with CSPs around the world, and our ongoing engagements with regulatory bodies, this paper offers examples of two effective and popular types of service differentiation - sponsored data and application-based zero-rating—and proposes best practices that can be applied to markets where Network Neutrality is a significant consideration.

Arguably, Network Neutrality will ultimately be an issue everywhere, so these best practices could apply universally across all markets today.

Transparency and Subscriber Notification

Confusing and unreasonably complex experiences are responsible for a large proportion of subscriber complaints, in general. Therefore, our first few recommended best practices concern transparency, and apply to both sponsored data plans and zero-rating plans:

1. For both zero-rating and sponsored data offers, all significant terms must be communicated to subscribers transparently, including but not necessarily limited to: commercial terms, a detailed description of the zero-rated/sponsored applications and content. Any technical requirements/limitations to participate in the offering (for both subscribers and content/application providers) should also be communicated transparently.
2. To improve the openness and inclusiveness of a zero-rating offer, CSPs should include a simple, public mechanism for customers to suggest new services to include in a zero-rated class. For instance, if a CSP launches a video streaming plan, then the public mechanism should let consumers suggest new OTT video providers for inclusion.
3. CSPs should consider notifying the user when he or she accesses zero-rated/sponsored content, to provide confirmation that the offer is operating in accordance with the plan. Similarly, CSPs could alert those who aren't subscribed to a zero-rated offering about that offering when they access content within the zero-rated class (e.g., when a T-Mobile subscriber who has not opted into the Binge On plan—described below—accesses a streaming video service like Netflix). Optimally, the notification itself would allow non-subscribers to click a button to engage in a workflow for opting into the zero-rated plan.

Sponsored Data Plans

A sponsored data model is one in which a third party (neither the CSP nor subscriber) sponsors some or all of the cost to deliver content or applications to the end user. Think of sponsored data as the Internet equivalent of a toll-free number.

CSPs who implement sponsored data use cases should ensure that:

1. The ability to become a sponsor should be equally available to all who provide Internet content, applications, or services at a given unit price (e.g., per megabyte, per 15-minute period, per click) for the data, including potential volume discounts.
2. The sponsored data should not be prioritized beyond what would otherwise be done for purposes of reasonable network management.
3. There is a streamlined set of open APIs and documentation to join the sponsored data plan, to ensure maximum accessibility to all potential sponsors.

Real Examples of Sponsored Data

The following are real examples of sponsored data in action.

Tesla and GM OnStar

Tesla has sponsored remote diagnostics for its car owners on an opt-in basis for some time. Under the arrangement, Tesla can troubleshoot any issues with its cars in real time and pick up the bill for the data. GM

OnStar has offered a similar service for many years.

Amazon

Amazon offers free 3G wireless connectivity by sponsoring the data charges for downloads from its book library to the Amazon Kindle and other e-reader products. Amazon ultimately pays the operator for the bandwidth.

AT&T

With AT&T Sponsored Data, users browse websites, stream video, and enjoy apps on their wireless device without impacting their personal data plans, when they are accessing sponsored content.

One argument against such sponsored data plans is that small content or application developers could not afford to be “sponsors” as much as the big players. Of course this proposition could be advanced universally, across every aspect of business in all markets, which in no way makes it inherently unfair. The big companies can afford more advertising, a better technological infrastructure to deliver their content and applications with better performance (including co-locating servers), and can negotiate better deals with suppliers, to name just a few advantages.

Size is a benefit of success in all free markets, which doesn’t make it wrong, as long as no structural barriers prevent smaller competitors from competing and growing. Sponsored data does not represent such a structural barrier. In fact, adoption to date of AT&T’s Sponsored Data plan seems to suggest the opposite: smaller application providers, like Syntonic, Aquato, and HipCricket (hardly household names), are among the first to sign up.

While there is no requirement in any business to make it easy for someone small to over-compete against someone large (they normally have to earn a sustainable, disruptive advantage), with offerings like AT&T’s, where sponsored data is easily and rapidly available (like a toll-free number), it may accelerate such disruptive innovations if the value proposition of the new app/content/service supports it.

With sponsored data, small application and content providers can participate to the extent they can afford to do so (as with all their other marketing activities). As long as the terms, such as the price per unit, for sponsored data are not unduly discriminatory against small application and content providers, then everyone can participate to the extent they deem commercially sensible. Wouldn’t a new, small game developer be interested to pay for some of the cost of its new game downloads, perhaps on a promotional basis? Any developer that includes advertising as part of the business model would have an incentive to get their application into users’ hands as quickly as possible—and sponsored data can be one path to achieving that.

Verizon

Verizon has also announced a sponsored data program: FreeBee Data. According to Verizon, the pricing model is based on the type of content being sponsored. Every time someone clicks on sponsored content (active content is marked by a FreeBee Data icon), the sponsor is charged a per-click fee. Each sponsored click includes a fixed amount of data depending on the content type (video, audio, etc.). Other pricing packages and models, such as usage-based pricing, also exist.

Video Clips
FreeBee Data for Mobile Video Streaming.
In 30 seconds, a great product video can convert a mobile user into a customer. Many people are selective about when and how they use their mobile devices. With FreeBee Data for mobile video, you can encourage greater mobile engagement by offering sponsored video streaming.
FreeBee Data for mobile video lets your customers enjoy video clips without incurring data usage charges. Because you sponsor the data, your mobile viewers are able to enjoy:
• Your product videos and ads with no data charges
• Brief video highlights with no data charges
• Movie trailers with no data charges
[Learn more](#) about how you can sponsor mobile video streaming and get more return on your mobile marketing investment with FreeBee Data.

Audio Streaming
FreeBee Data for Mobile Audio Streaming.
Between music streaming, podcasts and audiobooks, people spend a lot of time listening on their smartphones and tablets. FreeBee Data for mobile audio is a sponsored data service that frees your mobile audio content from data usage charges. When you sponsor data, your mobile listeners are able to enjoy:
• Podcasts with no data charges
• Music streaming with no data charges
• Audiobooks with no data charges
[Learn how](#) you can treat your customers to 30 minutes of sponsored streaming enjoyment with FreeBee Data for mobile audio. Now that's a sound mobile marketing investment!

App Downloads
FreeBee Data for App Downloads.
Making your mobile app stand out from the crowd can be a challenge – especially in a world where millions of apps are vying for the same limited space. With FreeBee Data for app downloads, you can increase your chances of earning a place on consumers' mobile devices through sponsored app downloads.
Here's how it works: When Verizon subscribers see your app in the store, they also see the bee telling them they can download the app with no data charges.
[Learn more](#) about how FreeBee Data for app downloads can help boost your mobile app audience.

Mobile Websites and Apps
FreeBee Data 360.
With FreeBee Data 360, you can sponsor some or all of the mobile content on your website or app so consumers will be able to access your content without impacting their data plans. This service is billed on a per gigabyte pricing model.
Discover the power of FreeBee Data 360, now available to all Verizon post-paid subscribers. Get in touch with a Verizon representative to [learn more](#).

Figure 2: Examples of Verizon's FreeBee Data

Vox Telecom and Local Retailers

Vox Telecom in South Africa teamed up with a local electronics retailer on a sponsored promotion that offers one million megabytes (or one Terabyte) of free data on Vox Telecom's Fat Pipe™ Premium ADSL service with the purchase of a Samsung Smart TV.



Figure 3: Vox Telecom's Sponsored Data Promotion

Subscribers in Vox Telecom's serving area who purchase a new Samsung Smart TV simply enter the MAC address of their new television through an online Vox Telecom portal and a Terabyte of premium Fat Pipe ADSL service is theirs—simple as that.

This bonus Terabyte of data is good for a full year and can be consumed on the Samsung Smart TV or any other device in the home, for any application or service.

Application Zero-Rating Plans

Another way to differentiate services is through “zero-rating”. Some people use the terms “sponsored data” and “zero-rating” interchangeably, but there is a key distinction: with zero-rating, the CSP creates a price for a service tier that it believes is sufficient to include unlimited use of certain data (such as messaging, streaming radio or streaming video), and receives no additional reimbursement from a third party.

From the subscriber’s perspective, unlimited usage of an application or class of applications is bundled into a fixed price plan, without the chance of additional charges related to usage of the application or application class. Accordingly, users get price certainty—a powerful psychological feeling—around the usage of their favourite applications.

For CSPs launching zero-rating plans, we recommend that:

1. The “unlimited” offer applies to all content/applications in the zero-rated class (e.g., all streaming radio services, not just Pandora or Spotify). CSP-owned (in whole or in part) services should only be zero-rated if all other services in its class are also identically zero-rated.
2. The zero-rated data should not be prioritized in the network, beyond what would otherwise be done for purposes of reasonable network management.
3. The CSP should not be compensated by the content/application provider per unit of zero-rated data.
4. When the zero-rated data includes data from different service categories (e.g., Facebook includes HTML, video, chat, voice, photos, etc.), zero-rate all of the data (i.e., not just the HTML and photos). Subscribers find the alternative (e.g., a “Facebook” service includes *some* Facebook traffic, but not all) difficult to understand, which could lead to transparency issues and frustration. Additionally, for services (like Facebook) in which a user might click on a link and be taken to a different (i.e., not zero-rated) site, then—in accordance with the transparency principles—the CSP should alert the subscriber to that fact (e.g., a message along the lines of “You are now accessing content that will be billed at your regular data rate of ___/GB”).

Commercially speaking, zero-rated plans have worked best with high-value, low-bandwidth applications and content, as the combination allows for broad adoption of a service in an unlimited fashion at a reasonable price. Even with T-Mobile’s Binge On plan in the US (described below), only low resolution streams of the bundled video streaming services are included.

It’s also feasible to make zero-rated application bundles time-specific as well, so as to shift network usage to off-peak hours when network capacity is generally more available and to reduce opportunities for network congestion (see the Vivacell Armenia example, in the section below). This approach benefits all users, and the CSP.

While such plans zero-rate all data during specified hours, they could also encourage time-shifting by focusing on peer-to-peer file sharing, cloud storage, backups, and other “unattended” activities and services that can be bandwidth-intensive but aren’t time-sensitive to the subscriber.

Real Examples of Zero-Rating

The following are real examples of application zero-rating in action.

Note that in regions where Network Neutrality rules are in force or likely to be, making the chat, email, social networking, and other bundles referenced below open to all like applications or services in a zero-rated class would more effectively mitigate claims of “unfair disadvantage” to allay Network Neutrality concerns. Alternatively, the CSP could zero-rate only one application in a class, but at the subscribers’ choosing.

Econet Wireless

Econet is a CSP in Africa that serves markets with very low ARPU³. In Zimbabwe, Econet Wireless uses zero-rating to tailor offerings to users in this price-sensitive demographic. Zimbabweans can buy unlimited access to either

3. Approximately US\$8 across the Econet group according to a May 2015 report.

WhatsApp⁴ or Facebook⁵ for as little as \$0.30 a day, \$0.95 a week, or \$3 a month.

Rather than diminishing competition amongst other service providers, Econet's plans have spurred competitors in Zimbabwe to launch similar plans, giving even wider access to the Internet on an affordable basis.

Furthermore, as one aspect of its commitment to social responsibility, Econet launched Econet Zero, which zero-rates educational content for all broadband customers, including all university sites and 52 educational sites such as Wikipedia, online courses, and others⁶.



Figure 4: Econet Wireless Zimbabwe's zero-rated application bundles

Certainly it isn't the purpose of Network Neutrality to limit such socially valuable options.

SMART Communications

In the Philippines, mobile operator SMART Communications offers bite-size, application-specific service plans to fit users' particular preferences and needs. SMART found that their subscribers were neither understanding nor adopting traditional (i.e., for all applications and services) data plans.

On a webinar discussing the plans⁷, SMART noted:

“In the Philippines, paid mobile data is not mainstream, mainly because of a lack of understanding on charging...volume charging. They don't understand megabit-charging,” said Michele Curran, Head of Broadband and Data Services Marketing for SMART

Today, SMART offers email, chat, photo, social, and other packages, in 15-minute, 3-hour, or per-day unlimited access, depending on the particular application and plan, for an affordable fixed price. During the bite-sized subscription term, the packages provide “always-on” access to the apps anywhere, without the need for a WiFi connection or any other data plan.⁸

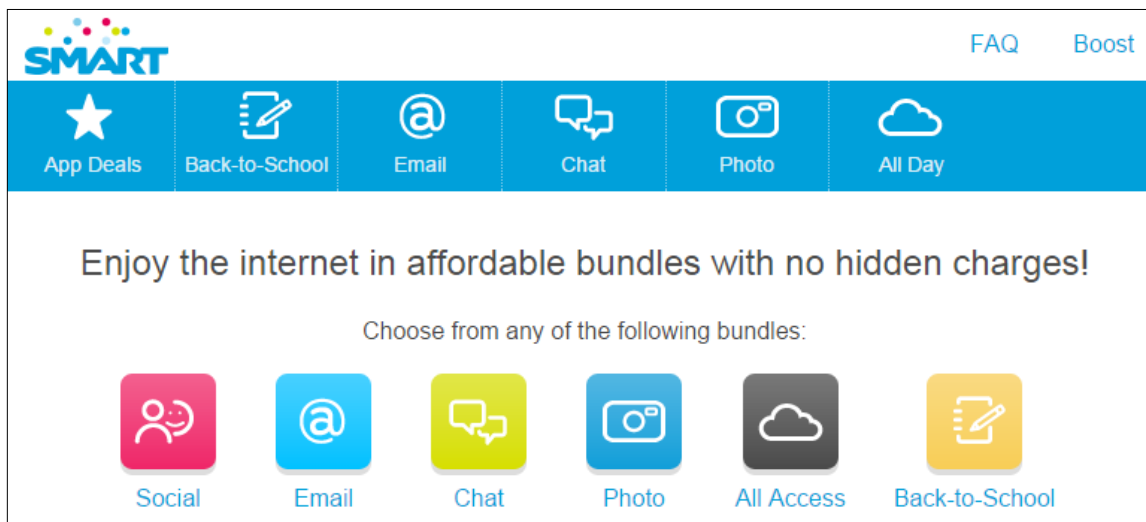


Figure 5: SMART Communication's zero-rated application plans

Again, to be more aligned with broader concepts of Network Neutrality, CSPs can make the various offers open to any similar application in each class (social, email, chat, photo, etc.) or to just one application in the class, but at the subscriber's choice.

4. You can learn about the service in [Econet Knows Exactly how to Delight Their Customers](#)
5. This service is showcased in [Econet's Facebook Experiment Pays Off](#)
6. For more information, check out [Econet Eradicates Barriers to Digital Education](#)
7. The webinar is available for streaming [here](#)
8. You can learn more about this service in [Smart Communications: Getting Mobile Customers Using Data](#)

Telefónica Movistar

In several of Telefónica’s Movistar mobile properties in Latin America, users can purchase bolt-ons to augment their mobile data packages (i.e., additions to their base plan); these bolt-ons allow unlimited use of chat, email (or the two combined), social networking, and other packages.⁹

Before these tiers were introduced, subscribers could only purchase data in 200 MB blocks, and all data usage counted against this prepaid quota. In practice, subscribers were fearful of rapidly consuming the data block, and were not adopting data plans—the same motivator mentioned above with respect to SMART’s introduction of innovative service plans. These tiers introduced the understanding and peace of mind that comes with fixed-price unlimited usage, and subscriber adoption soared.



Figure 6: Telefónica Movistar’s bolt-on plan

These tiers introduced the understanding and peace of mind that comes with fixed-price unlimited usage, and subscriber adoption soared.

One argument against zero-rated plans is that they *could* be disadvantageous to applications or services not included in the zero-rated bundle, but does real-world experience bear that out? Not in Movistar’s case. The first version of Movistar’s bundles didn’t include the messaging application WhatsApp. Despite that fact, WhatsApp grew dramatically in popularity, so Movistar added it to the plans.¹⁰ That said, to allay Network Neutrality concerns, we still recommend that a class of applications be zero-rated rather than individual applications or a select group, and that subscribers be able to nominate additional services for inclusion.

Tigo

Through Google Play, Tigo (a Millicom brand throughout Latin America) offers *Smartapps*, a service that lets Internet subscribers bundle the monthly/annual subscription cost of a designated number of application-specific subscriptions into their prepaid or postpaid plans.¹¹ These aren’t the \$0.99 one-time app downloads, but recurring subscription services, such as Deezer.



Figure 7: Tigo’s Smartapps

While the application traffic itself is not zero-rated, the subscription fee is covered or subsidized by the CSP—an interesting twist. Essentially, Tigo pays for some or all of the subscription price on behalf of its subscribers (a good deal for them), and in return Tigo benefits from increased subscriber loyalty and the application providers get a new channel to market for increased subscriptions—a triple win!

9. This service is outlined in [Telefónica: The World’s Most Famous Application Plans](#)

10. According to Sandvine’s latest Global Internet Phenomena Report on the Latin American region, WhatsApp is now the most popular third-party messaging client, by bandwidth, in the region, overtaking applications that were in the bundle well before them, from massive companies like Google, Yahoo and others.

11. Tigo’s Smartapps are explained in [Tigo \(Millicom\): Solving the OTT Dilemma with Smartapps](#)

To address markets with a stricter Network Neutrality environment, CSPs could consider eliminating the commercial arrangement with the application provider, which would enhance openness.

Alternatively, a CSP could publish a fixed “subscription discount rate” required for any application developer to join the plan. To further enhance plan openness, CSPs could publish open APIs for ease of integration to back end systems. Even with such changes, the CSP would still get the benefit of increased subscriber loyalty, and subscribers and app developers continue to reap their benefits as well.

T-Mobile

In June 2014 in the U.S., T-Mobile launched their [Music Freedom](#) plans that zero-rate popular music services. The Music Freedom plans started with seven streaming services (Pandora, Rhapsody, iHeartRadio, Apple Music, Slacker, Spotify, Milk Music, and Beatport). T-Mobile pledged to add more services based on user demand and, sure enough, now includes 33 services in the plan and is open to more.

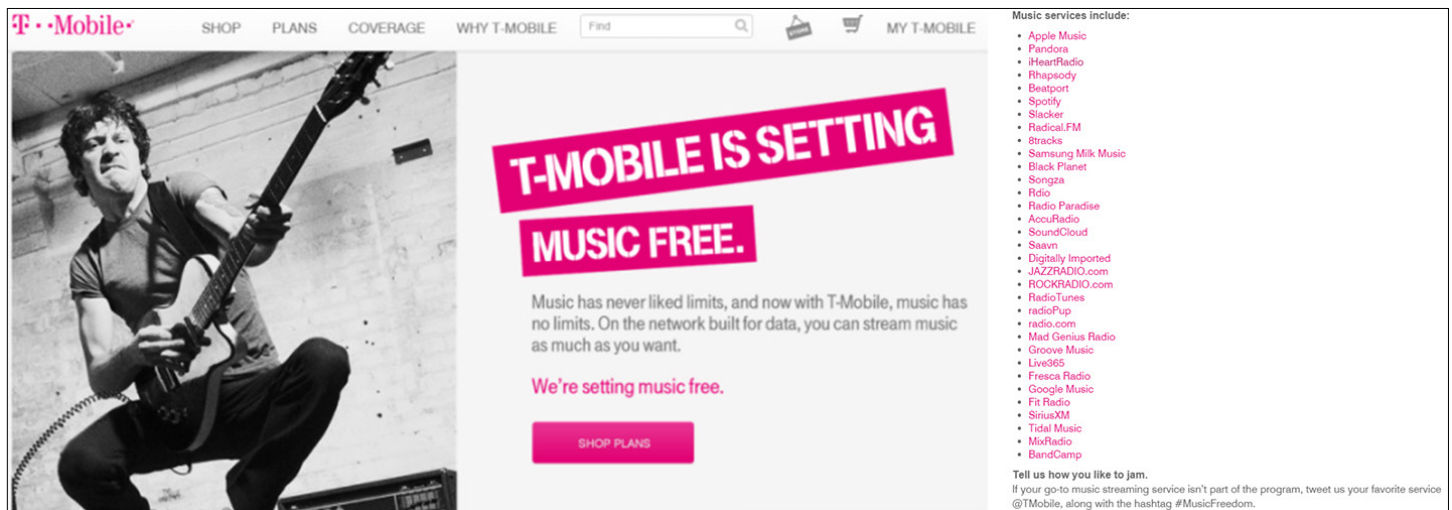


Figure 8: T-Mobile’s Music Freedom plan

Even more recently, T-Mobile launched its unlimited streaming video plan, Binge On.

With Binge On (as with Music Freedom), T-Mobile is opening up the offering to *all services in the streaming video category* that can meet the technical specifications required for implementation. This point is critical in the context of the United States, given the FCC’s “general conduct” rule. If a CSP arbitrarily excludes a particular service from a zero-rated offering, it is more likely that the CSP would be seen as creating an unreasonable disadvantage for that service.

According to Arstechnica¹² and other industry media outlets, when FCC Chairman, Tom Wheeler, was asked about Binge On at a press conference following the FCC’s November 2015 meeting, he stated:

“It’s clear in the Open Internet Order that we said we are pro-competition and pro-innovation. Clearly this meets both of those criteria. It’s highly innovative and highly competitive.”

Mr. Wheeler went on to say that the FCC would keep an eye on Binge On under the “general conduct” standard. He notes that a carrier:

“...should not unreasonably interfere with the access to someone who is trying to get to an edge provider and an edge provider who is trying to get to a consumer. So, what we are going to be doing is watching Binge On, keeping an eye on it, and measure it against the general conduct rule.”

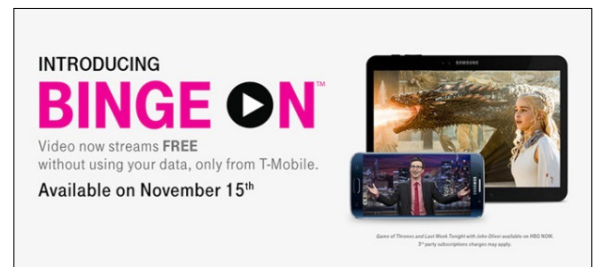


Figure 9: T-Mobile’s Binge On plan

12. See this [article](#).

Videotron

In Canada, Videotron launched an Unlimited Music plan that mostly mirrors T-Mobile's Music Freedom offering. Like T-Mobile, Videotron launched with the most popular streaming music services in its territory, but has committed to continue to add streaming music services to the plan.

While no separate Network Neutrality rules have been put in place in Canada, per se, section 27 of the current Telecommunications Act in Canada states:

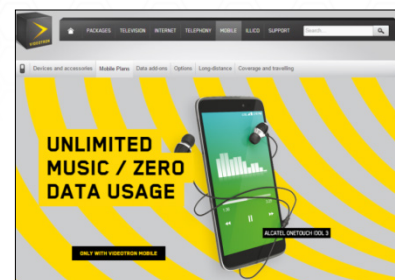


Figure 10: Videotron's Unlimited Music plan

"Just and reasonable rates

27 (1) Every rate charged by a Canadian carrier for a telecommunications service shall be just and reasonable.

Unjust discrimination

(2) No Canadian carrier shall, in relation to the provision of a telecommunications service or the charging of a rate for it, unjustly discriminate or give an undue or unreasonable preference toward any person, including itself, or subject any person to an undue or unreasonable disadvantage."

So a test similar to the general conduct rule in the United States "Open Internet Order" exists in Canada to determine whether the Videotron plan is reasonable.¹³

Vivacell Armenia

Look at the image below, showing a few plans from Vivacell Armenia, and note especially the text at the bottom that states, "Free of charge unlimited Internet for night hours".

This plan feature clearly doesn't discriminate against any application or class of applications, and leaves it to the subscriber to decide what traffic gets zero-rated by flowing in the early morning hours.

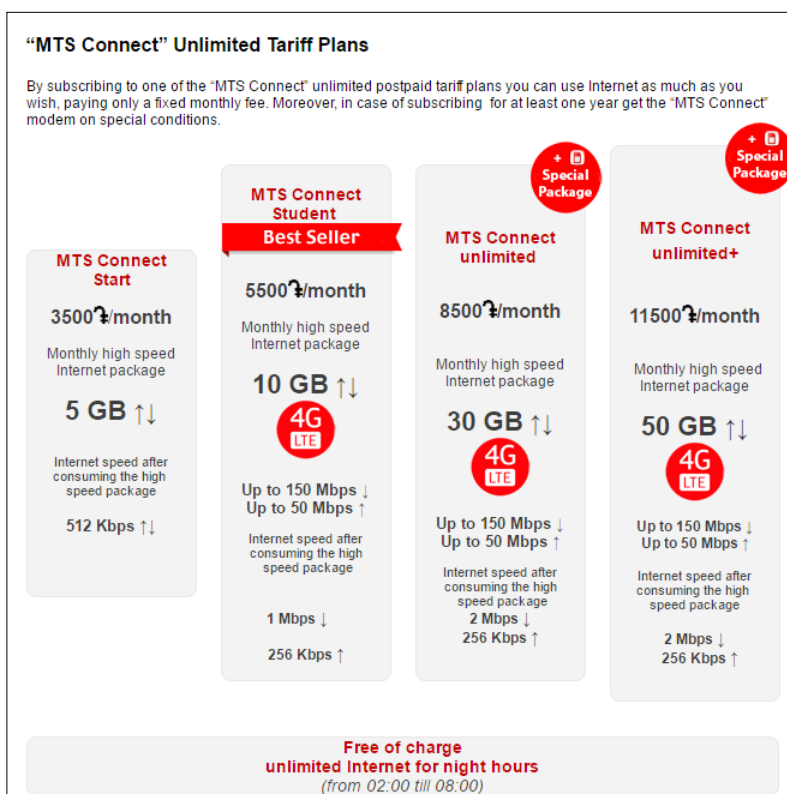


Figure 11: Vivacell Armenia's unlimited plans

13. Sandvine has filed a document with the Canadian Radio-television and Telecommunications Commission (under Part 1 Proceeding 8661-P8-201510199) that makes the case that the plan is reasonable.

Reference Implementation

For maximum accuracy, zero-rated and sponsored data plans must take advantage of billing-grade traffic detection capabilities. Misclassification of traffic could lead to significant subscriber billing errors, including over-billing, which has regulatory implications. Additionally, for maximum flexibility and speed to market, the implementation should be based on pre-integrated, standardized products that conform to broadly adopted network standards for the Policy and Charging Rules Function (PCRF) and the Policy and Charging Enforcement Function (PCEF).

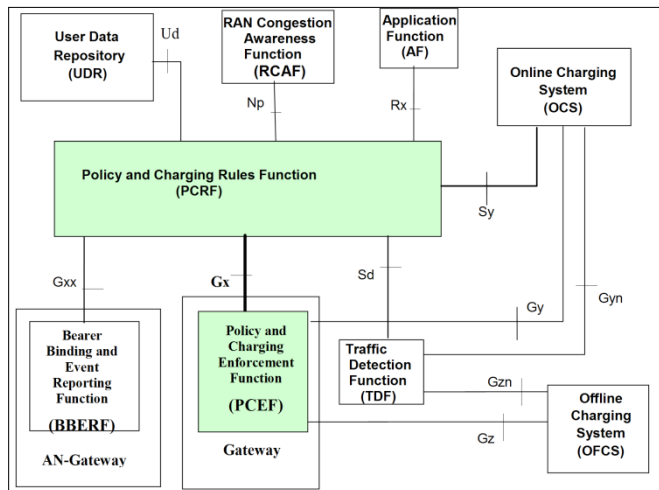


Figure 12: 3GPP Standards-based PCC Architecture (from 3GPP TS 23.203v13.5.1)

Many systems claim to be 3GPP Gy-compliant but fail in real-world deployments because the implementation does not match the standard specification. To illustrate this point in simple terms, we can examine just the relationship between the PCEF element and the OCS as specified by 3GPP standards (see Figure 12).¹⁴

Figure 13, below, shows three diagrams of charging architectures:

- The left-most architecture is compliant with 3GPP online charging standards: the connection between the measurement component in the data path and the OCS is direct and in real-time
- The middle figure is not compliant: the introduction of an intermediate processing node breaks the direct connection and breaks the real-time nature of the usage reports
- The right-most figure has an identical architecture to the middle figure, but the diagram has a superficial box misrepresenting two separate components as one: this box does not rectify the indirect, non-real-time nature of the architecture

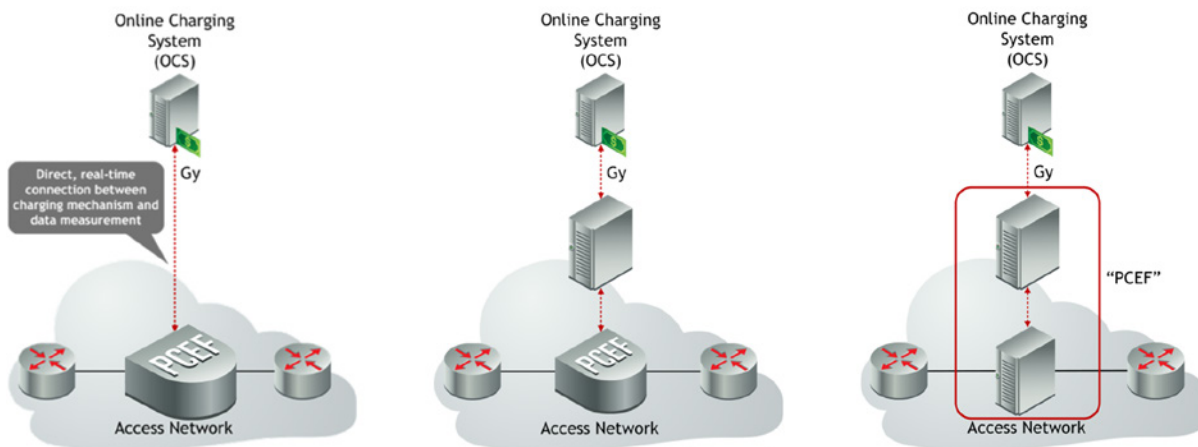


Figure 13: Three diagrams representing three implementation approaches: only the left-most diagram is compliant with 3GPP standards for online charging

14. Non-standard, custom development dramatically increases implementation time and risk, and decreases the flexibility to quickly experiment with new plans. By contrast, Leon De Fleuriot, head of Group Broadband and OTT Services for Ecomet Wireless, reports that by using standards-based features, time to implement zero-rated plans was only two weeks.

From the CSP's perspective, failure to adhere to the strict 3GPP standards for online charging results in revenue leakage and unreliable billing for all online charging use cases. The degree of revenue leakage varies by use case based upon a handful of factors, so each must be considered separately.¹⁵

If there was no difference in charging accuracy and reliability between these deployments, then non-compliance would not be of significant importance—but that is not the case. The only way for a CSP to achieve minimum revenue leakage and maximum reliability is by adhering to the 3GPP requirements.

Conclusions

A growing number of CSPs globally offer service plans that feature sponsored data and/or application zero-rating. The plans are successful, are beneficial to subscribers, and create a viable form of competition amongst CSPs.

Furthermore, there is no single definition of Network Neutrality globally and one is unlikely to emerge in the near future. Operating within that limitation, sponsored data and application zero-rating can be tailored to meet the needs of Network Neutrality, however it is defined (or not) in a region.

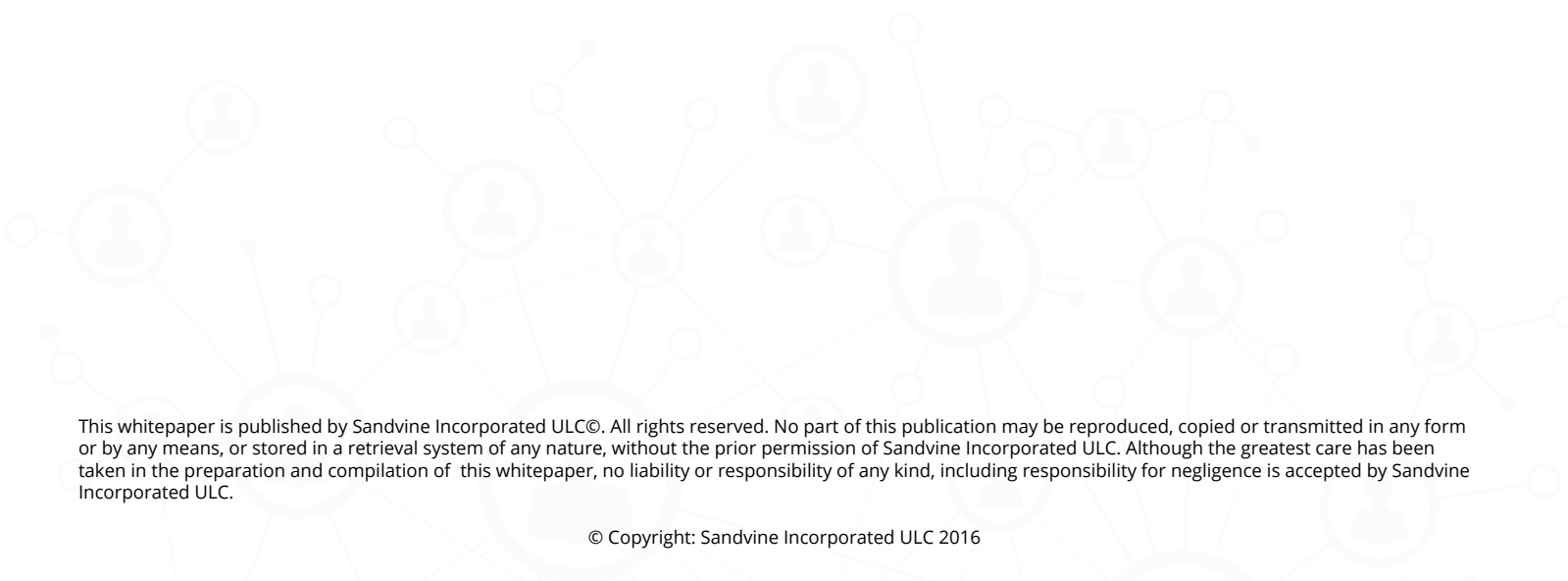
Based on a global review of plans that employ sponsored data and zero-rating, it is possible to create a set of best practices that are likely to keep CSPs on the right side of even the most stringent Network Neutrality rules. We offer an initial set of such best practices, fully accepting that they may evolve as ongoing experimentation and regulation occurs. A few themes emerge:

- 1. Openness:** Ensure the sponsored data plan or zero-rating plan is open to all members of a sponsored/zero-rated data class, and not just available to selected content/application providers.
- 2. Same commercial terms:** The CSP should offer substantially the same commercial terms to all data sponsors (allowing for volume discounts, etc.), and for zero-rating the CSP should not be compensated by the content/application provider per unit of zero-rated data.
- 3. No prioritization:** Sponsored/zero-rated data should not be prioritized in the network.
- 4. Transparency:** The terms and availability of the plans should be transparent to subscribers. Notifications to subscribers when they are accessing sponsored or zero-rated content/applications would aid in transparency. To the extent there are terms required of content/application providers to participate in a plan, those terms should be transparent as well.

Invitation to Provide Feedback

Thank you for taking the time to read this whitepaper. We hope that you found it useful, and that it contributed to a greater understanding of subscriber services, and in particular what services are possible within the spirit of network neutrality. If you have any feedback at all, then please get in touch with us at whitepapers@sandvine.com.

15. The Sandvine whitepaper [Online Charging with Diameter Gy: Considerations for Accuracy and Reliability](#) includes an examination of the risk of revenue leakage for a range of use cases when using incorrect deployment architectures such as the two shown in Figure 12.



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