



Subscription Television Piracy

Sandvine **Global Internet Phenomena Spotlight**



Introduction

By producing or licensing TV, film, sports, and other premium content, network operators aim to create content libraries that increase the appeal of bundled offers (e.g., triple and quad play services), stand out from the competition, and provide exclusive value to their subscribers, all of which contribute to top-line revenue. For some operators, the video strategy is to deliver TV and video-on-demand (VOD) services exclusively via an app.

Television content can be pirated in many ways. BitTorrent can be used to share files with peers, the media player app Kodi can be modified with unofficial add-ons, and even websites can host files that subscribers can easily stream in a browser.

A new emergent form of subscription television piracy, that aims to replicate the live television experience offered by cable and satellite providers is seeing increased adoption in developed markets. Left unchecked, we expect this live television piracy trend to grow both due to the ease and relatively low cost of accessing unlicensed content and due to the facilities available on the internet for pirates to leverage.

The risk to operators is enormous: continued adoption of pirate TV streaming services could lead to increased cordcutting, significantly impacting top-line revenue, overall profitability, and - by extension - undermining an important aspect of the business model of operators.

IDENTIFYING SUBSCRIPTION TELEVISION PIRACY

To better understand the problem of live television piracy services, Sandvine worked with several North American fixed access operators to research the adoption of subscription television piracy services on their networks.

As the first step towards understanding the prevalence and characteristics of TV piracy service consumption, Sandvine researched and identified the leading TV piracy services using both network data and information from online forums that openly discuss the topic (e.g., r/IPTV on Reddit). This research allowed us to construct and maintain an up-to-date list of TV piracy services; this list could then be used to measure and to project the number of subscribers accessing TV piracy services on a real-time basis.

Our research reveals that across multiple tier-1 North American fixed access networks, 6.5% of households are communicating with known TV piracy services and these services accounted for more than 6% of downstream traffic in the peak evening hours.

THE ECONOMICS OF SUBSCRIPTION TELEVISION PIRACY

The subscription television piracy ecosystem (Figure 1) contains several different participants, and multiple revenue streams.

End User (Consumer)

- Pays a subscription fee to an unlicensed video provider for access to content
- May make a one-time payment to purchase a dedicated STB that comes fully loaded with media software; alternatively, may install media player software on another device (e.g., tablet, laptop, smartphone)
- May believe that the services are legitimate, may know that they aren't, or may not want to know either way

Box Seller

- Sells a fully-loaded STB configured with media player software to access video streams; some boxes may be produced by vendors who also sell STBs to operators

Across multiple tier-1 North American networks, **6.5% of households** are accessing known subscription television piracy services



- May or may not also act as an unlicensed video provider; may receive a sales commission for recommending/selling particular unlicensed video provider services

Unlicensed Video Provider

- Sells access to unlicensed video streams
- Acquire content from licensed digital streams and from over-the-air (OTA) broadcasts; could be as simple as an individual at home capturing content from a operator's television service, then re-encoding and distributing it
- May provide a single channel, or might aggregate many into a more comprehensive service

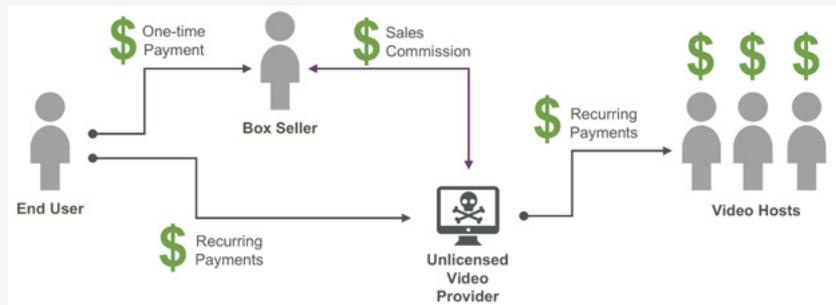
Video Hosts

- The cloud providers whose services are used to host live and on-demand video content
- Unlicensed video providers pay the video hosts for use of their servers

Figure 1

Today's television and video piracy ecosystem.

Note the complete absence of the content developer and content licensee from the revenue streams



7 million subscribers
 x \$10/month
 x 12 months
 = **\$840 million a year**

Extending the 6.5% figure introduced previously across the United States and Canada's fixed access broadband subscriber base (approximately 106 million users) and combining it with the average/typical price of a TV piracy service (\$10 USD per month) begins to quantify the true economic impact of this piracy ecosystem; such an exercise indicates that TV piracy could quickly become almost a billion dollar a year industry for pirates.

But while that money is lining the pockets of pirates, what does that mean for operators? The risk to their revenue would be even more significant. Unlike pirate services, operators who offer television services must license the content they broadcast, and thus have to charge more for their services.

7 million subscribers
 x \$50/month
 x 12 months
 = **\$4.2 billion a year**

Using the same numbers from the previous calculation, and using \$50 as an approximation for the cost of television service, the pirate television services could quickly cost operators in the United States and Canada five billion dollars a year. This calculation is far from perfect, because not everyone who subscribes to a pirate service would sign up for a traditional TV package, but the number serves to illustrate the threat for operators.

Operators aren't the only ones harmed financially by pirate television services. The money that subscribers pay for licensed TV services goes directly into the pockets of the content creators to produce original programming. If the television revenues of operators decline, there is less money to invest in original programming, which in turn could lead to fewer jobs in the entertainment industry.



DEVICES AND SOFTWARE

In Sandvine's Global Internet Phenomena Spotlight on the "Fully-Loaded Kodi Ecosystem," we revealed that almost 9% of North American households have, within the home, a device running Kodi. While these pirated services can run on Kodi, it is not the platform of choice for most subscribers. Figure 2 below describes just some of the devices/platforms that are commonly used to access video and television piracy services.

Purpose-Built STB

- A hardware box with embedded software solely designed to access television streams via IP
- Popular manufacturers include Infomir and Dreamlink

Kodi

- Software that can run on PCs, smartphones, and other devices that was originally designed for the playback personal media files
- Unofficial add-ons have enabled the ability to access pirate video services

Roku

- A leading STB designed to access legitimate streaming services
- Can be side-loaded with applications via unofficial sources that enable the ability to access pirate video services

Smartphones and Tablets

- Both Android and iOS app stores contain apps that can emulate the embedded software found in purpose-built STBs
- Video player apps can stream M3U8 files used by pirate TV services can easily be installed

PCs

- Pirate television and video service can be accessed via a web browser or any video apps that can play M3U8 files

Almost 95% of TV piracy traffic is driven by purpose-built STBs that are designed to faithfully recreate the experience of using a STB with a traditional cable or satellite television subscription.

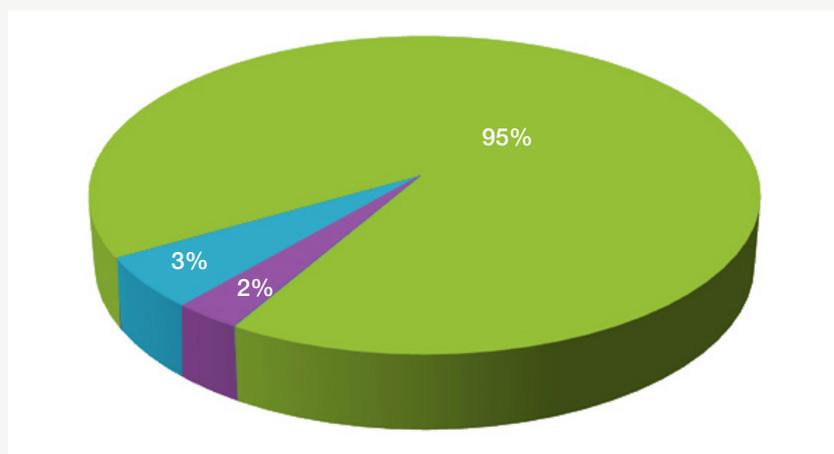
The second-most popular platform for TV piracy services is Kodi. While it offers a slightly inferior user experience relative to STBs, the fact that Kodi software is compatible with many devices that are already in the homes of subscribers makes Kodi a convenient mechanism for using a TV piracy service.

Outside of the two most prevalent device types, there is a long tail of platform software and devices that drive the remaining share of pirate TV streaming: this long tail includes Roku boxes, smartphones, tablets, and PCs.

Figure 2

TV piracy traffic share by device type

- STB - 95%
- Kodi - 3%
- Roku - 2%





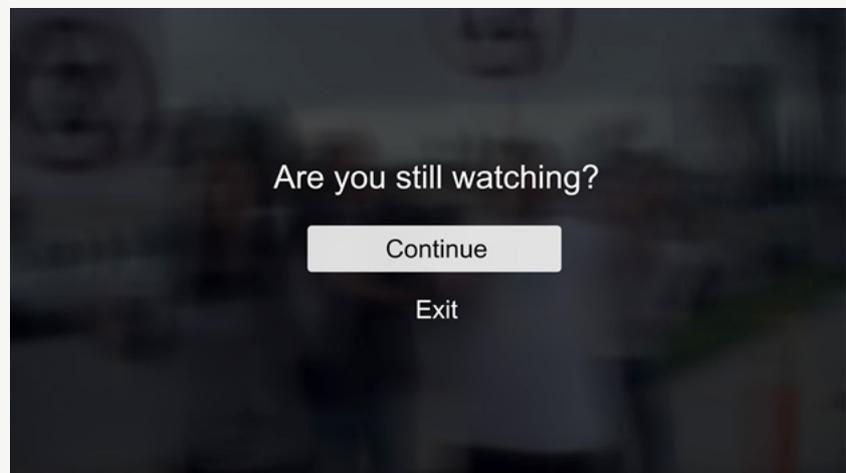
THE PHANTOM BANDWIDTH PROBLEM

In preparation for introducing new STBs to their markets/subscribers, cable and satellite companies put the physical devices and firmware through rigorous testing to ensure they are reliable and secure for their users.

Additionally, many OTT video providers like Netflix build protections into their client software to stop streaming after a set amount of time or viewer inactivity (e.g., no pauses, jumps, etc.) to ensure that excessive, unnecessary, and unintended bandwidth usage doesn't occur (see Figure 3). From Netflix's perspective, this is a goodwill gesture for their subscribers to help ensure they don't exceed their bandwidth caps by accident should they fall asleep binge-watching, but it is also a cost saving mechanism as Netflix incurs content delivery costs.

Figure 3

Netflix prompts users to confirm they are watching to prevent phantom bandwidth consumption

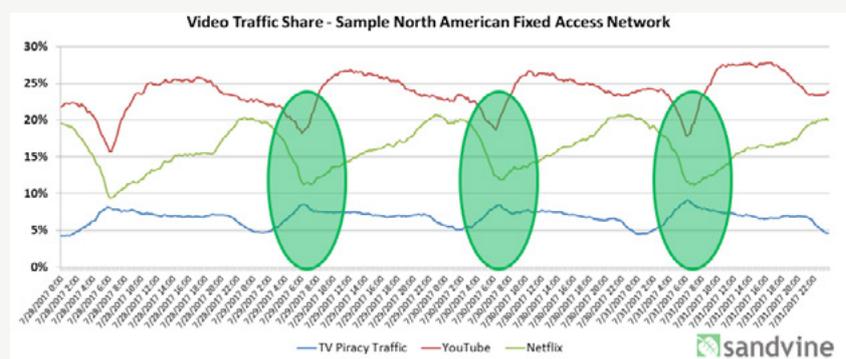


$$4000 \text{ Kbps stream} \times 24/7 \times 30 \text{ days} = 1.1 \text{ TB per month}$$

The STBs designed to consume pirated video and TV services appear to have little concern for network utilization. Based on Sandvine's testing, many of these devices will stream continuously unless the box itself is physically powered off. This constant streaming results in a tremendous amount of 'phantom' bandwidth, a term we used to describe data that is transmitted but not viewed by anyone. Figure 4 below shows how the video traffic share of TV piracy services increases in the late evening hours as Netflix users turn off their streams and the poorly engineered TV piracy boxes continue to stream.

Figure 4

Phantom bandwidth consumption causes the traffic share of TV piracy services to increase at night





Again, quantifying the problem isn't difficult; if a user doesn't turn off their STB and has their device tuned to a channel which streams at 4000 Kbps (a typical bitrate for many HD channels on pirated TV services), then over the course of a month that STB could consume over a terabyte of data.

This reckless consumption of bandwidth hurts three parties in the TV piracy ecosystem:

1. **Subscribers:** who could experience overage charges should they be on a plan with usage-based billing
2. **Network Operators:** who must bear the brunt of transporting that pirate streaming data even though their subscribers are not actively consuming it; there can also be costs associated with customer support from subscribers who may call to complain about poor performance or about an unexpected bill caused by the phantom bandwidth
3. **TV Piracy Service Provider:** who must pay video hosting services for the bandwidth they are using to transmit their pirated service

TELEVISION PIRACY VIEWING HABITS

Because millions (and sometimes billions¹) of dollars can be spent by operators to license content, understanding what channels subscribers are watching can provide valuable insight.

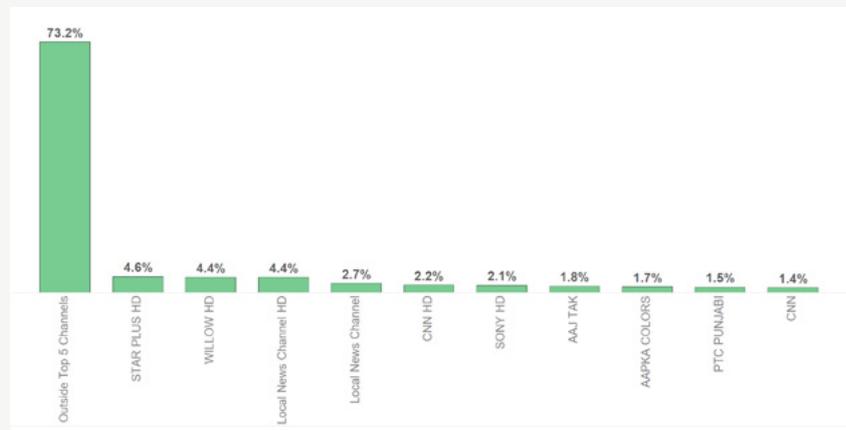
By inspecting unencrypted channels, operators gain a more complete perspective on how subscribers are viewing pirated content (see Figure 5); from a market research perspective, operators can also use this insight to identify channels that are in high demand and aren't available via any licensed means in an operator's region.

On many of the illegal pirate TV services there can be thousands of channels available to subscribers; with so much selection, usage is not concentrated in a few channels but spread across the spectrum of choices.

Figure 5 below shows that the channels beyond the top-10 account for 73% of all viewing, with the most viewed channel (Star Plus – a channel from India) accounting for only 4.6%.

Figure 5

A report of the top pirated TV channels and the long tail of the remaining thousands



¹ DirectTV [paid \\$12B for eight years](#) of rights to NFL Sunday Ticket in the US



TELEVISION PIRACY DRIVERS

During the investigation, Sandvine observed four distinct usage trends tied to the viewing of pirated TV services, which we believe are significant drivers of their growth:

- Premium Television
- Live Sports
- News
- International/Expatriate Content

Premium Television

Since 2012 TorrentFreak, a leading new source for piracy-related topics has determined that Game of Thrones is the most pirated television show in the world.²

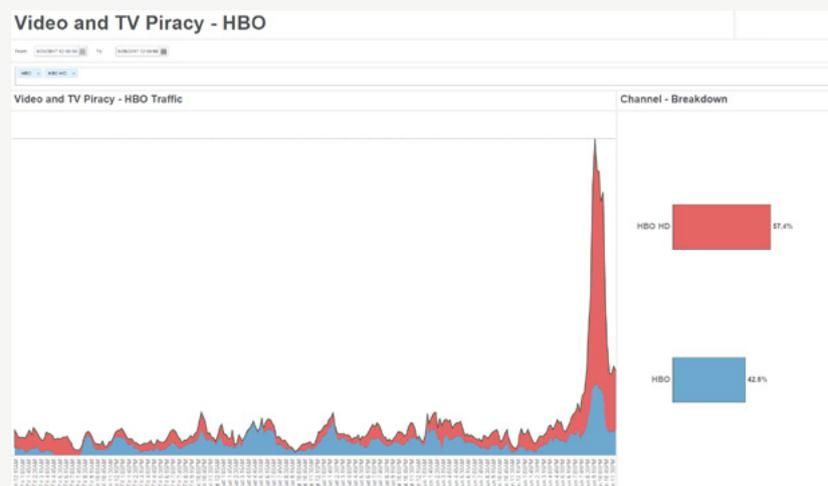
Season seven of Game of Thrones was in full flight during the data collection period for this report, presenting a convenient investigative opportunity. Sandvine examined the traffic corresponding to the various HBO channels over the course of a week to determine if the most pirated show using BitTorrent was also popular on services that provide live pirate streams.

Figure 6 below shows an over 400% increase in traffic to HBO channels on Sunday nights when a new episode of Game of Thrones airs, compared to peak levels observed during the week.

This surge in viewing underscores how premium television programming is one of the biggest victims of pirate services as the monthly service fee for the pirated services (approximately \$10USD) is less than what an HBO bolt-on or HBONOW subscription would cost (approximately \$15USD) on a traditional cable or satellite package.

Figure 6

Can you spot Sunday? HBO channels see huge spikes when Game of Thrones airs



Live Sports

One of the main sources of revenue for modern sports leagues is television rights. As an example, in the United Kingdom, Sky Sports paid £5.14 billion³ for three years of exclusive television broadcast rights for the English Premier League (EPL).

For broadcasters, the business case for live sports content is a simple one; unlike Game of Thrones, where it is possible to avoid spoilers and watch the next day, sporting events are best experienced live.

2 [TorrentFreak: Game of Thrones Most Torrented TV-Show of 2016](#)
 3 [Sky and BT retain Premier League TV rights for record £5.14bn](#)

In exchange for paying enormous sums to sports leagues for live rights, broadcasters typically receive exclusive local broadcast rights. This exclusivity, a phenomenon more common in the

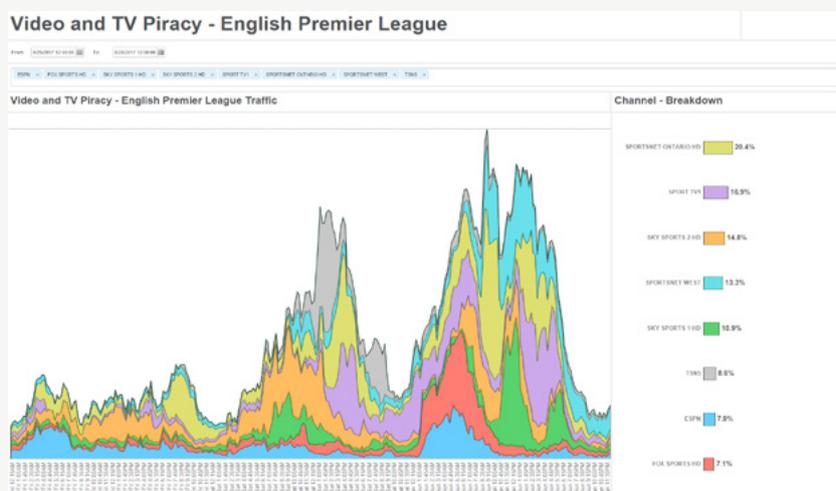


US, means that the games of a local team like the NBA's Boston Celtics cannot be streamed via an OTT service (NBA Gametime) by a subscriber who lives close to Boston and that the only way to see those games – other than attending in-person – would be to subscribe to a cable or satellite package containing a local sports channel.

Figure 7 below shows the bandwidth from channels airing the matches of the 2017/2018 EPL season. The channels observed include rights-holders in the US, Canada, and the United Kingdom. The aggregate levels observed during match-time shows that approximately 20% more subscribers were watching EPL matches on Saturday than those who watched Game of Thrones the same weekend.

Figure 7

Pirate TV services can broadcast EPL streams from broadcaster in multiple countries

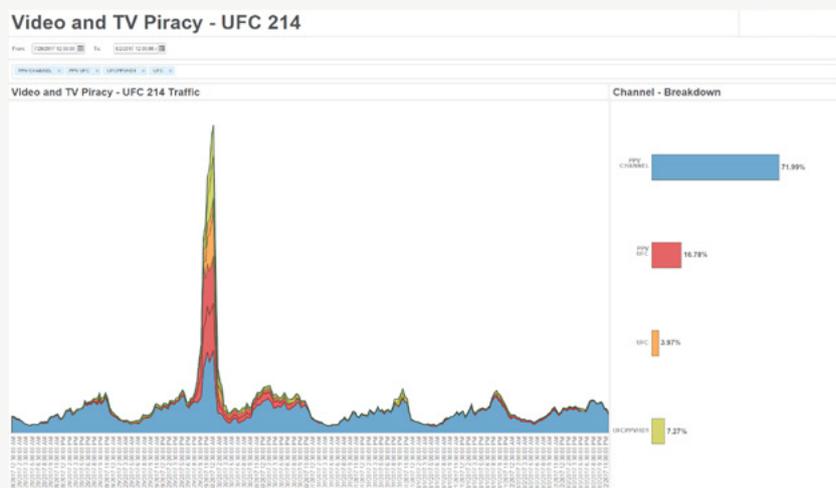


While the channels which air the EPL matches are often bundled with basic cable and satellite subscriptions, pay-per-view (PPV) programming has always come at an additional cost.

Figure 8 below shows the bandwidth of channels that aired UFC 214 in July, 2017. The cost to purchase the fight in both the US and Canada was \$59.99, but it seems clear that many subscribers preferred to watch the event via pirate streams. At its peak, traffic for UFC 214 more than doubled traffic levels for both EPL matches and new episodes of Game of Thrones.

Figure 8

Traffic profile of UFC 214





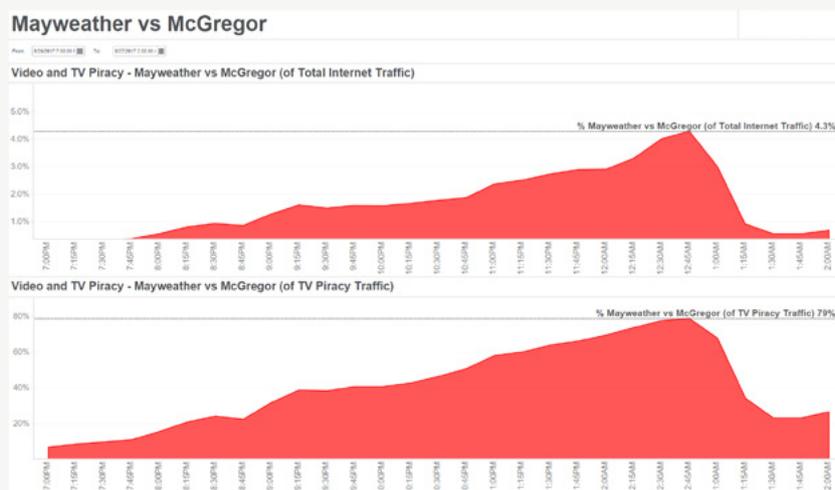
An even bigger event than a standard UFC PPV occurred on August 25, 2017 when Floyd Mayweather and Connor McGregor squared off in the boxing ring and charged viewers \$99.95 for the right to view it on PPV.

On one portion of a tier-1 North American fixed access network, at its peak, the pirated UFC and PPV channels for the Mayweather/McGregor fight accounted for almost 80% of all pirate TV traffic (see Figure 9).

But what does that mean in terms of number of viewers? The bitrates for these pirate TV streams varies between service, but a typical stream is between 3000 and 4000 kbps. If we extrapolate the bandwidth observed from those pirate TV channels known to be streaming the fight, Sandvine estimates that approximately 1% of all households on this portion of the network were pirating the boxing match.

Figure 9

Mayweather vs. McGregor pirate TV bandwidth



Pirate TV services were of course not the only way the match was streamed. The match could also be accessed via free streaming sites, which typically offer lower quality and less reliability than services that are paid for. If factoring in those numbers were at least equal to those who viewed on paid pirate TV services, it is possible that pirated viewers could have approached the four million viewers⁴ who paid for the fight legally.

The widespread adoption of pirate TV services could represent a significant revenue risk for the PPV industry, because - as discussed in Sandvine's whitepaper entitled [Video and Television Piracy: Ecosystem and Impact](#) - the end user experience is nearly identical to normal cable, and while monthly subscriptions are typically in the \$10USD range, subscribers also have the option to purchase day passes to these for as little as \$2USD.

News

In what may come as a surprise to many, the top bandwidth-consuming channels on every network examined are 24/7 cable news channels.

Figure 10 on the following page, which was captured from a North American network, shows that local news channels and CNN are the dominant sources of television news among the pirate streaming crowd.

What is interesting about the shape of the traffic curves is that the levels remain relatively constant throughout the day. Like all video applications, pirate TV bandwidth peaks in the

4 [Mayweather-McGregor PPV Buys Near Record](#)



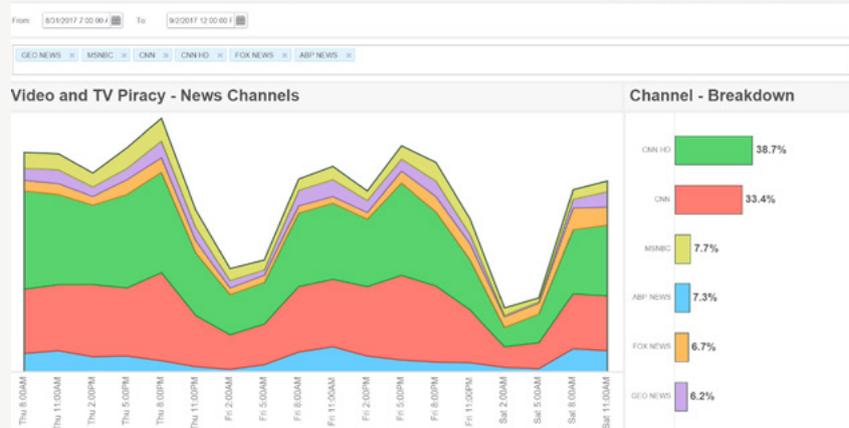
evening as people come home, but the traffic curve of news channels differs from the shape of the TV piracy services as a whole.

Sandvine hypothesizes that the reason why news channels have relatively steady traffic rates throughout the day is that a group of users are watching the same news channel for the entire day. This use case makes us believe that pirate TV services could be common in locations like waiting rooms, office lobbies, or bars where a television is installed to help distract clients while they are waiting for an appointment.

Figure 10

Report highlighting the traffic profile of select news channels

Video and TV Piracy - News Channel



International/Expatriate Content

After the news, the most significant channels in terms of overall bandwidth usage are international channels. The top channels vary from network-to-network (and even from neighborhood-to-neighborhood) because of shifting demographics, but as an example, two of the top five channels on a network in a major North American city were channels originating from Southeast Asia.

While local cable and satellite providers do offer some channels from Southeast Asia, those channels are typically offered as a bolt-on to an existing television package. Without paying to legitimately license the content, TV piracy services can meet the demand for non-local content at a price that is significantly lower than official channels.



THE FUTURE OF SUBSCRIPTION PIRATE TELEVISION SERVICES

Sandvine believes that these video and television piracy services represent a real threat to the revenue streams of network operators.

While the adoption rates of these services are still relatively low when compared to a legitimate service like Netflix, it is easy to see how their low cost and ease-of-use could quickly make them a billion-dollar piracy problem and how operators may need regulatory and legal support to address the issue.

Sandvine will continue to track the emergence of this phenomenon and will regularly report findings on [our blog](#). If you are interested in learning more about the video and television piracy ecosystem functions and what network operators can do to understand the problem, Sandvine has published a whitepaper that complements this report: [Video and Television Piracy: Ecosystem and Impact](#).

ABOUT SANDVINE

Sandvine helps organizations run world-class networks with Active Network Intelligence, leveraging machine learning analytics and closed-loop automation to identify and adapt to network behavior in real-time. With Sandvine, organizations have the power of a highly automated platform from a single vendor that delivers a deep understanding of their network data to drive faster, better decisions. For more information, visit [sandvine.com](#) or follow Sandvine on Twitter at [@Sandvine](#).



USA
2055 Junction Avenue
Suite Number 105
San Jose,
CA, 95131
USA

EUROPE
Svärdfiskgatan 4
432 40 Varberg,
Halland
Sweden
T. +46 340.48 38 00

CANADA
408 Albert Street,
Waterloo,
Ontario N2L 3V3,
Canada
T. +1 519.880.2600

ASIA
RMZ Ecoworld,
Building-1, Ground Floor,
East Wing Devarabeesanahalli,
Bellandur, Outer Ring Road,
Bangalore 560103, India
T. +91 80677.43333

Copyright ©2019 Sandvine Corporation. All rights reserved. Any unauthorized reproduction prohibited. All other trademarks are the property of their respective owners.

This documentation, including all documentation incorporated by reference herein such as documentation provided or made available on the Sandvine website, are provided or made accessible "AS IS" and "AS AVAILABLE" and without condition, endorsement, guarantee, representation, or warranty of any kind by Sandvine Corporation and its affiliated companies ("Sandvine"), and Sandvine assumes no responsibility for any typographical, technical, or other inaccuracies, errors, or omissions in this documentation. In order to protect Sandvine proprietary and confidential information and/or trade secrets, this documentation may describe some aspects of Sandvine technology in generalized terms. Sandvine reserves the right to periodically change information that is contained in this documentation; however, Sandvine makes no commitment to provide any such changes, updates, enhancements, or other additions to this documentation to you in a timely manner or at all.