

# ITU-T Technical Report

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## DSTR-OTTBypass

### OTT bypass





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### Summary

Although (over-the-top) OTT bypass may broadly affect other services, the focus of this Technical Report is restricted to the bypass of standard international voice calls. This Technical Report describes OTT bypass\* and provides an economic and policy background on its nature and implications, and discusses impacts to stakeholders including regulators and consumers, policy challenges, protection of users, among other issues. It also provides a working definition of OTT bypass and a country case study.

### Keywords

Over-the-top, OTT, OTT bypass.

### Note

This is an informative ITU-T publication. Mandatory provisions, such as those found in ITU-T Recommendations, are outside the scope of this publication. This publication should only be referenced bibliographically in ITU-T Recommendations.

### Change Log

This document contains Version 1 of the ITU-T Technical Report DSTR-OTTBypass on "OTT Bypass" approved at the ITU-T Study Group 3 meeting held in Geneva, 9-18 July 2024.

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\* OTT bypass is considered fraud in some contexts. Whether or not OTT bypass constitutes fraud is a legal matter subject to Member State sovereignty.

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# Technical Report ITU-T DSTR-OTTBypass

## OTT Bypass

### 1 Scope

Although over-the-top (OTT) bypass may broadly affect other services, the focus of this Technical Report is restricted to the bypass of standard international voice calls. This Technical Report describes OTT bypass<sup>1</sup> and provides an economic and policy background on its nature and implications, and discusses impacts to stakeholders including regulators and consumers, policy challenges, protection of users, among other issues. It also provides a working definition of OTT bypass and a country case study.

### 2 References

- [1] Sahin, M., and Francillon A. (2016), *Over-The-Top Bypass: Study of a Recent Telephony Fraud*. Proceedings of the 2016 ACM SIGSAC Conference on Computer and Communications Security.  
<https://doi.org/10.1145/2976749.2978334>.
- [2] Department of Telecommunications, Ministry of Communications, Government of India. (2018). *Amendment to the UAS License on Internet Telephony*.  
<https://dot.gov.in/sites/default/files/internet%20telephony%20UAS%20amendment.pdf?download=>

### 3 Abbreviations and acronyms

This Technical Report uses the following abbreviations and acronyms:

ILD	International Long Distance
ILDO	International Long-Distance Operator
ISP	Internet Service Provider
MNO	Mobile Network Operator
MSISDN	Mobile Station International Subscriber Directory Number
OTT	Over-the-Top
PSTN	Public Switched Telephone Network
SIIT	Surtaxes on International Incoming Traffic
TRAI	Telecom Regulatory Authority of India
VoIP	Voice over Internet Protocol

### 4 International call flow scenarios and what is OTT bypass?

There is no agreed definition of OTT bypass in the ITU context, although efforts to develop a definition remain underway within ITU-T Study Group 2 (ITU-T SG2, lead Study Group on telecommunication/ICT service definition).

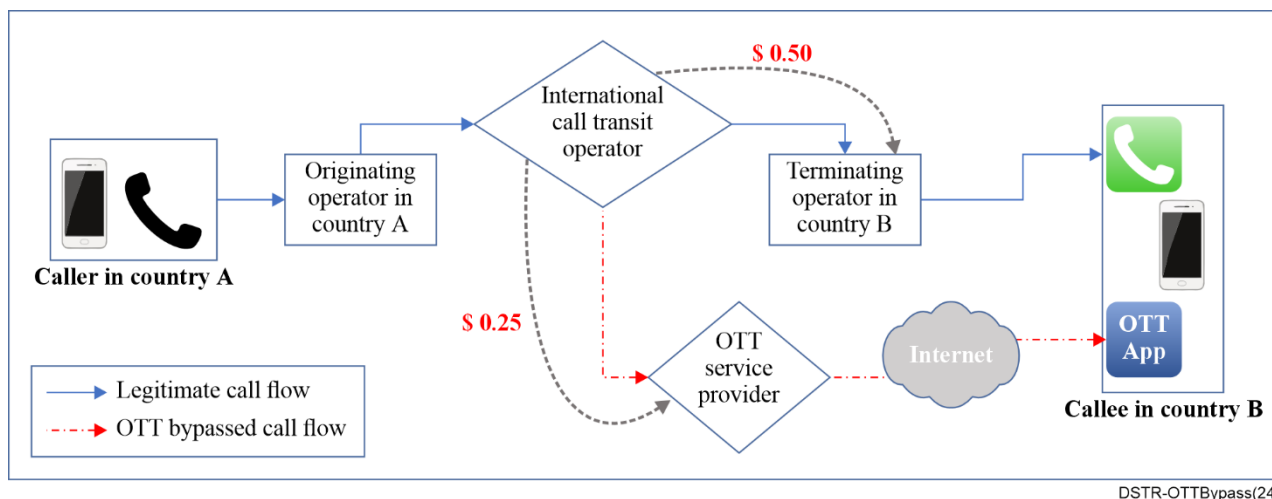
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<sup>1</sup> OTT bypass is considered fraud in some contexts. Whether or not OTT bypass constitutes fraud is a legal matter subject to Member State sovereignty.

The following working definition of OTT Bypass, as advised by ITU-T SG2, will be used for purposes of this report:

*"OTT bypass refers to the redirecting of terminating traffic from PSTN (including mobile) onto Over-the-Top applications and in reverse direction."*

Figure 1 below provides a fictional notional example of an OTT bypass call and compares its flow with a standard call flow.



**Figure 1 – Standard call vs. OTT bypass call**

The caller in country A makes a phone call via a landline or mobile phone to a mobile phone number in country B. If the call is not bypassed, it would flow along the blue line; the originating operator in country A passes the call to an international transit operator and the call is terminated by the mobile network operator (MNO) who is responsible for the receiver's mobile number in country B. For the bypassed call, the international transit operator passes the call to the OTT service provider and the call is terminated over the receiver's OTT application. For convenience, the MNO in country B will be often denoted as a "bypassed" operator, and the transit operator who passed the call to the OTT provider will be denoted as "bypassing" operator. The caller may not recognize the bypass while paying the same amount for the standard call.

For such a bypass to occur, redirection of the call is essential. This happens only if the mutual interests of a transit operator who relays the international call and the OTT service provider are aligned. In fact, there is an inevitable economic incentive to engage such a redirection both to the transit operator and the OTT service provider. A standard international call travels several operators before it reaches the final destination. All operators who contributed for the call to flow are compensated from the call revenue. The originating operator in country A receives the call charge from the caller and pays a transit fee to the transit operator. The transit operator, while earning the transit fee, pays a termination fee to the terminating operator in country B. The terminating operator receives the termination fee from the transit operator. Note that the incentive for the transit operator to bypass the call would stay as long as the termination rate of the OTT provider is lower than that of the other terminating operators. For the OTT service provider, the termination fee is a new revenue source without incurring any or incurring a very low cost as the calls are passed to the Internet and terminated over the OTT service provider's own application. This shows that two entities have mutual interest for the call to be bypassed and the OTT bypass will not be dismissed as long as these incentives remain.

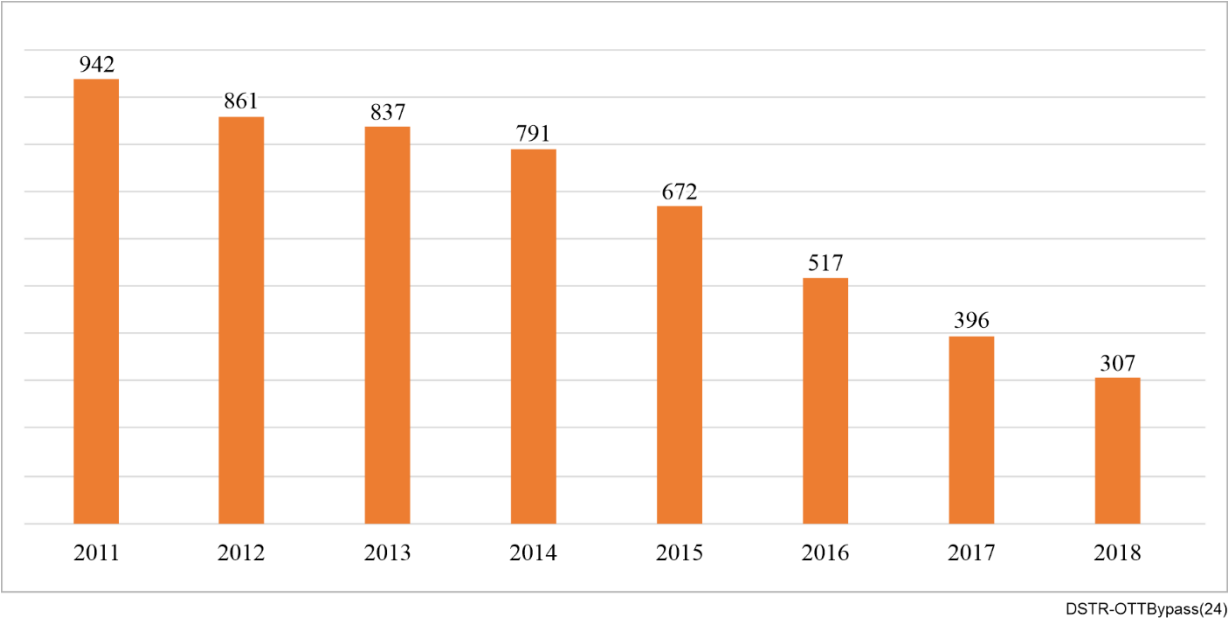
To enable the bypass, the OTT service providers need to know the receiver's mobile number. After all, the identification of the called party was specified only by the mobile number. Indeed, many OTT applications require a user's mobile number, more specifically MSISDN (Mobile Station International Subscriber Directory Number), during service registration. When a call is arrived at a transit

operator's network who is in collaboration with an OTT service provider, it will be checked whether the call can be re-routed to the OTT network. To be re-routed, the mobile number has to be registered to the OTT network and the user associated with the mobile number should be online. In that case, the call will be successfully bypassed and terminated on the OTT application.

**5        Impacts associated with OTT bypass**

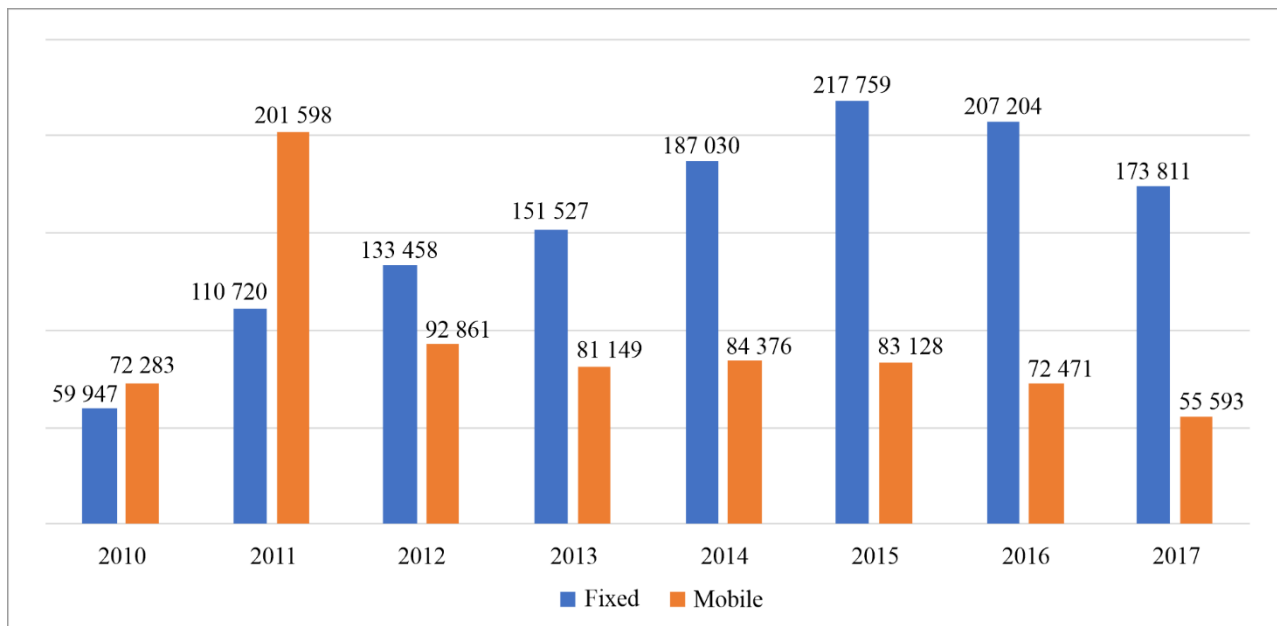
**5.1     Telecom operators**

A quantitative magnitude of damage caused by the OTT bypass is still difficult to assess, but the direct impact on termination revenue and traffic is apparent. The most direct damage from OTT bypass may lead to revenue loss for the bypassed operator. OTT bypass also results in a decline in incoming international voice traffic and revenue. Sonatel describes such a situation in Figure 2.



**Figure 2 – Impact of OTT bypass on incoming international, Sonatel, 2019**

Of course, the reason for such a decrease in traffic (and revenue) cannot be attributed to OTT bypass alone. Various alternative technologies for international calls have appeared, which, other than or in combination with OTT bypass, might have contributed to the decrease. The global volume of incoming international call minutes has also been declining as shown below in Figure 3.



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Source: ITU World Telecommunication / ICT Indicators Database.

**Figure 3 – Incoming International Traffic: All regions of the World (million minutes)**

In addition to the lost revenue, the bypassed operator might have to deal with customers' complaints regardless of their responsibility. A user who experienced OTT bypass might make a complaint about low quality connection during the call, or even complain about the bypassed call itself. The originating operator is subject to face similar situations as well. The caller who recognizes that the call was terminated on the OTT application instead of a normal phone application is likely to question about the call charges. As it is not the service that the caller has intended, a reduction or refusal of the charge can be inquired. Further, some of the users may report such experiences to a government agency which could potentially harm the overall image of telecom operators. All complaints, regardless of the operators' responsibilities, will certainly have negative impacts on the operators and these are another cost for the telecom operators to bear due to the OTT bypass. In addition to these challenges and constraints, operators must from now on deploy costly mechanisms to combat various and increasingly sophisticated forms of fraud, which is a source of major disruption and significant collateral damage at the sector level.

## 5.2 International call transit carriers

The market for the international call transit also can be affected as more OTT service providers can enter the market after acquiring suitable licenses. New entrants will increase overall competition and exert downward pressure on the market price, i.e., the wholesale transit fees. The decrease of wholesale price may benefit consumers if it leads to lower retail call charges for international calls. However, the price reduction of the retail market is not necessarily followed even if the upstream market price decreases. Moreover, considering that the OTT service providers are vertically integrated and hence more cost-effective than non-OTT transit carriers, the OTT service providers may become dominant in the wholesale international call transit market from a dynamic perspective, without any restriction on their bypass activity. A worst-case scenario contains the possibility of predatory pricing in which the price of the international call transit market eventually increases after the OTT service providers become dominant in the market. Since the amount of information on the international call transit market is also very limited, the attention and collaboration of Member States should be strengthened.



### 5.3 End-users

The negative impacts to caller and receiver from the OTT bypass appear in various forms. The unexpected extra payment and the low quality of connection are just typical complaints. The caller has to suffer from low quality connection without any ex-ante notification and pay the same charges of a standard call. The receiver may have not been informed about the call quality of a bypass option or may not recognize the turn-off option for the bypass. There should be an unexpected number of miscellaneous activities, some of which are reported in [1] are summarized below:

- The application does not ring during an incoming call, but shows a notification afterwards
- Users appear online on the application even when they do not have an Internet connection
- The caller hears a ringing tone, even when the recipient is not online
- Multiple call notifications are received for a single call
- Poor quality or interrupted calls (delay, noise)
- Receiving an international call from a landline on the OTT application.

### Others

Besides the telecom operators and end users, the countries with surtaxes on international incoming traffic (SIIT) suffer from the reduction of their tax revenue. The proportion of SIIT to the total tax revenue in a country should differ from country to country and the SIIT itself may contribute to the reduction of international incoming traffic. However, as the OTT bypass only reduces the standard international incoming traffic, it is expected the amount of SIIT would decrease. An example of SIIT charges is shown in Table 1.

**Table 1 – Example of SIIT charges in Sub-Saharan African countries**

Country	SIIT
Chad	XAF 50 (\$0.08) per minute
DRC	\$0.08 per minute
Ghana	GHS 0.13 (\$0.03) per minute <sup>1)</sup>
Guinea	GNF 571 (\$0.07) per minute
Niger	XOF 88 (\$0.15) per minute
Rwanda	RWF 85 (\$0.12) per minute
Source: GSMA (2017), "Taxing mobile connectivity in Sub-Saharan Africa – A review of mobile sector taxation and its impact on digital inclusion".	
NOTE – The SIIT for Ghana might have changed to \$0.06 per minute according to Entsie (2019).	

## 6 Protection of users

As highlighted earlier, the caller may suffer from a low-quality connection without any ex-ante notification and yet, pay the same charges of a standard call as a result of OTT bypass. Hence, there is need to protect consumers. There is need to clearly inform OTT app users about OTT bypass as well as the switch-off option. Users who are informed about the negative side of the OTT bypass may voluntarily turn off the in-calling feature to avoid unexpected costs and lower quality calls. The OTT applications contain the bypass switch off option; therefore, providing an accessible and straightforward instruction on how to turn off the option would be helpful. For better protection, enforcing an opt-in policy to OTT service providers might be necessary. Users generally pay less attention to the details of options that OTT applications offer during the registration process and tend to skip the details and adopt the default option. After recognizing the bypass option is unwanted, another cost to turn off the option may become too burdensome for some users. Enforcing an opt-in

policy to OTT service providers, that is, the default option for in-calling feature will stay 'off' unless a subscriber turns on this feature may reduce such discordance.

## 7 Policy challenges

The main regulatory and policy challenge stems from the fact that OTT providers are not jurisdictionally constrained and local legislation does not apply to them in the jurisdictions that they are not physically present. This makes any policy intervention at national level ineffective. Prohibiting OTT service providers from misusing MSISDN may be effective but difficult to enforce. To enable the bypass, the OTT service providers need to know the receiver's mobile number. The MSISDN is attained by the OTT provider during registration for authentication purpose. When a call is received by the transit operator's network who is in collaboration with an OTT service provider, it will be checked whether the call can be re-routed to the OTT network. To be re-routed, the mobile number has to be registered on the OTT network and the user associated with the mobile number should be online. In that case, the call will be successfully bypassed and terminated on the OTT application. Hence, strictly monitoring and prohibiting the use of personal information other than for the original purpose, may be enforced.

## 8 Case studies

### 8.1 India

OTT bypass traffic is deemed illegal in India. India reported the amendment in the access services licenses which is required to regulate all international telephone calls, including Voice over Internet Protocol (VoIP), incoming from foreign countries. The amendment was made by the Indian government based on the recommendation of the Telecom Regulatory Authority of India (TRAI) in June 2018. The main reason for their suggestion was to declare any international telephony traffic without passing through the specially licensed gateways shall be deemed illegal and subject to disconnection. The relevant parts of the amendment requiring a regulation over international telephone calls are below:

*"Internet Telephony calls originated by International out-roamers from international locations shall be handed over at the International gateway of licensed ILDOs and International termination charges shall be paid to the terminating access service provider.*

*In case the Licensee is not able to ensure that Internet Telephony call originated outside of the country is coming through ILDO gateway, International out-roaming to Internet Telephony subscribers of the access provider shall not be allowed.*

*Further, the calls originated outside the country using internet telephony shall be routed through ILD (International Long Distance) Gateway like any other international call". [2]*

The amendment ex ante requires all incoming internet telephony calls from outside of the country to pass through an international gateway belonging to an international long-distance operator (ILDO) before it is terminated by a domestic operator. Otherwise, they shall be deemed illegal and the connection may be discontinued by the licensee. For OTT bypassed traffic, the redirection usually occurs in a transit phase, i.e., before the call reaches any network belonging to a domestic operator. Hence, most of the OTT bypass traffic shall be deemed illegal under this regulation, as such traffic is never expected to pass the gateways of ILDOs. However, practical enforcement for a disconnection is still in question.

When the receiver uses a Wi-Fi network, then the bypassed operator will not be able to inspect the call to assess if it passed an ILDO gateway(s). Enforcing the disconnection by the bypassed operator is not feasible in this case. The Internet service provider (ISP) providing the Wi-Fi connection may be able to detect the bypassed call pertaining to the case; however, blocking such traffic will possibly cause more problems, especially for ISPs to whom the network neutrality doctrine is enforced.

Likewise, even when a bypassed call is detected within the network of the bypassed operator, whether blocking the bypassed call can be enforced, at the cost of users' complaints or potential loss of users, is questionable.

## **9 Concluding remarks**

The world of telecommunications is changing rapidly and one of the most significant advancements in recent years is the rise of OTT applications. With the availability of high-speed internet and the increasing accessibility of smartphones, OTT platforms have become a preferred choice for users worldwide. While OTT bypass may be legal in some countries, it remains a big issue in other countries where it remains illegal. Therefore, it is important to find means and ways of addressing the concerns of those who regard it as fraudulent, as it affects several stakeholders including policy makers, regulators, consumers and network providers.

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