2.5 Regulating 'Over-the-Top' Services

OTT services are enabled by the **de-layering** of the industry. IP has separated carriage from content and allowed 'over-the-top' content and applications providers to deal directly with end users over networks whose owners and operators are excluded from these transactions. The move to LTE's all-IP architecture will create a more open environment for these OTT providers and third party services.

It is not only telecommunications that is affected. Internet television over broadband fixed and mobile networks is de-stabilising existing broadcasting industries.

In the following sections, we look at the policy issues raised by VoIP and other OTT services and the new concepts that apply before turning to regulatory options for managing VoIP and other OTT services.

- **Policy Issues**
- **Key Concepts**
- **VoIP**
- **Other OTT services**

Internet telephony, or "Voice over the Internet Protocol" (VoIP), is the first 'over-the-top' (OTT) service with major implications for the business models of both fixed and mobile network operators. More recently, text messages (SMS) have also been delivered OTT affecting the revenues of fixed and mobile operators.

◂ **Figure 5.1: OTT voice and messaging smartphone applications.**

From left to right: Skype, Google Voice, Viber, Talktone, Whatsapp, Blackberry and iMessage.

2.5.1 POLICY ISSUES

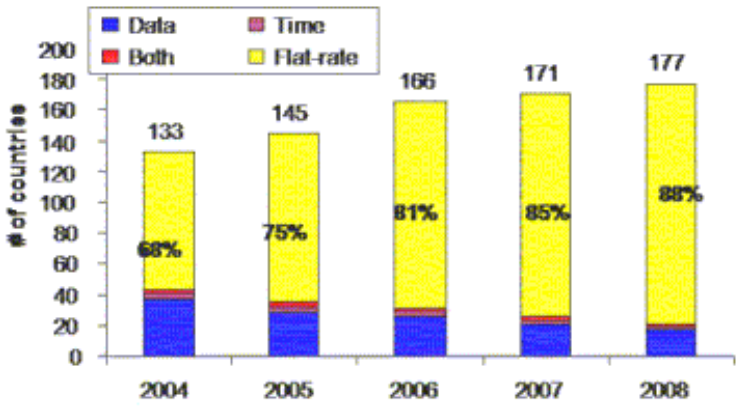
Proliferation of content and applications services is to be welcomed – they add utility for users. Some new 'over-the-top' (OTT) services did not previously exist and do not undermine the current operator business models (eg location-based GPS mobile services). Some new OTT services may threaten the economics of investing in fast broadband networks and (eg internet television).

But, change is inevitable. As network operators migrate to next generation networks, voice services will become software applications riding over the network. During this transition, policy-makers are finding different paths to balancing innovation,

investment and competition.

The many policy and regulatory issues specific to **VoIP** are considered below.

Regulators cannot hold back the tide of changes to maintain the status quo. To a large extent, existing operators are able to change their business models to stay afloat. For example, OTT services manifest themselves on networks as traffic. If network builders and operators align revenue models more with traffic, their financial position is more secure. This would reverse current trends [*].



◂ **Figure 5.2: Growth of Flat-Rate Pricing Strategies for Broadband Internet**

Source: Figure 4, Voice over Internet Protocol (VOIP), **GSR Discussion Paper**, November 2009

These changes are disruptive and inconvenient for those with a stake in existing arrangements. But the benefits of change outweigh the costs. For example, VoIP leads to dramatic reductions in the cost in telecommunication and this has beneficial impacts on the development of business and economic growth. India found that VoIP opened up new employment opportunities with call centres serving overseas markets.

Regulators generally support innovation. They prevent fixed and mobile operators from blocking or degrading competing services.

Practice Notes

- **Regulatory Implications of VoIP**

Reference Documents

- **GSR 2009 Discussion Paper, Voice over Internet Protocol (VoIP): Enemy or Ally**
- **OECD, Communications Outlook, 2011**

2.5.2 KEY CONCEPTS

VoIP has been around for a number of years but there are several other 'over-the-top' (OTT) concepts that will become increasingly important. The concepts are all the product of the digitisation of fixed and mobile networks. Key concepts include:

- **VoIP** also known as voice-over-broadband (VOB) or internet telephony takes a number of different forms. Across different platforms, VoIP services can be phone-to-phone, PC-to-PC ('on-net'), PC-to-phone ('inbound'), phone-to-PC ('outbound') and phone-to-phone ('bi-directional' between different networks). The different forms are reflected in licensing conditions. [*].
- **SMS** – the short message service (texting) has been a very lucrative business for fixed and mobile operators. While network quality is a major constraint to some OTT voice applications, SMS applications are less reliant on QOS, due to them using less data and having a higher tolerance for latency.
- **Applications (Apps)** – This term is now associated with smartphones. Early examples include Skype (first on fixed networks but now also mobiles) and there are now thousands provided by mobile operators and third parties [*]. Their important characteristic is that they are carried over the data part of mobile service.
- **Cloud Services** - The general idea of the 'cloud' is to store your media on the internet so you can access it from any device anywhere, as opposed to leaving it on a hard drive. Apple, Google, Amazon, Microsoft and Dropbox all offer cloud services.
- **Internet Television** – With Internet ('best-efforts') TV (e.g. Apple TV, Google TV, Netflix) the consumer pays for the content package separately, and in addition to, the broadband access package. There is no guarantee of the quality of service. The content provider may use a VPN (Virtual Private Network) to try and secure the content from copying or may be encrypted and decrypted. But, it is delivered over the top of the Internet Service (ISP) provider's network.
- **IPTV** - IPTV is not 'over-the-top' because it is provided directly by carriers and ISPs. The consumer pays the ISP for both the content package and the broadband delivery package (e.g. 'Triple Play' bundles telephony, broadband and television). This

allows the ISP to 'guarantee' some quality of service with its Content Delivery Network (CDN) to ensure that the video content is coming from the nearest possible server to the consumer's premise and over its own network.

Our focus in this module is on what these concepts mean for the regulation of competition and pricing. But we shall look also at consumer protection and other issues that arise in the context of VoIP.

Reference Documents

- **Peter Ingram, Voice Over Internet Protocol—An Introduction.**

2.5.3 VOIP

VoIP is the first of the apps enabled by IP to threaten traditional telecommunications business models because they depended on voice revenues (and mostly still do). Policy and regulatory issues and responses have evolved with the maturity of the VoIP market.

Early VoIP Market	Maturing VoIP Market	Mature VoIP Market
'Grey market' (self-help) bypass and illegal termination		
Quality of service (QOS)		Consumer protection
Universal Service		Security of transmissions
Defining VoIP and its legality	Regulatory capture	Net neutrality and blocking
Licensing	Emergency services	Location correspondence
Numbering	Number portability	Market size and growth
Promoting competition		(Anti-) competitive issues

◂ **Table 5.1: VoIP Regulatory Issues**

Source: Adapted from Table 1, VoIP enemy or Ally?, GSR 2009, P Biggs

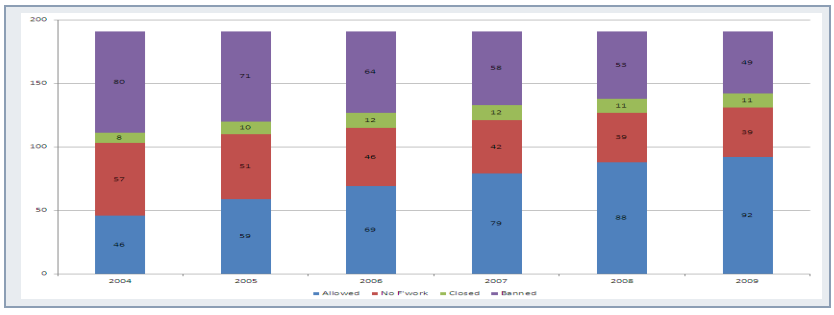
The key policy issue is how to regulate VoIP compared with the telephone services it replaces [*] or displaces. Some countries view VoIP as a voice service while others view it as data: a 'value-added' or 'information' service. For example, Bolivia, Czech Republic, Egypt, Jordan and the United States view VoIP as data, while Dominica views it as voice. In the European Union, VoIP can be classified as either an Electronic Communication Service or as a Publicly Available Telephone Service.

Despite its limitations, users increasingly view VoIP as 'functionally equivalent' to conventional telephone service. The quality of VoIP has improved and users can now obtain a PSTN telephone number and receive calls originated on the PSTN. Technical and consumer protection aspects are discussed in **regulatory implications of VoIP**.

Most countries licence different types of VoIP service. Policy makers then have to decide what aspects of conventional telephony regulation should apply to each class of VoIP service because the differences between VoIP and conventional voice service will have implications for universal service arrangements, telephone number management, public safety, and national security. For example, VoIP services are generally unable to provide access to emergency service if there is a power cut or to give reliable location information in the case of an emergency.

Recognizing the difficulties of translating existing regulatory frameworks into the IP world, the European Commission advocated a 'light regulatory touch' when it first examined VoIP regulation in 2004. The United States initially took a similar approach, but VoIP is becoming more regulated over time in the United States; especially in the context of security concerns (whether and how VoIP traffic can be monitored) and access to emergency call services. With a 'light touch', regulation is confined to specific matters such as access to telephone numbers, number portability, access to emergency services, universal service, and national security.

The number of countries attempting to ban VoIP is continuing to decline:



◂ **Figure 5.3: Status of VoIP Regulation Across ITU**

Source: Figure 2, **GSR 2009 Discussion Paper, Voice over Internet Protocol (VoIP): Enemy or Ally** November 2009

But it is very difficult to stop unlicensed VoIP services which can traverse the telephone network without detection. Even where regulators permit only limited or no VoIP services, incumbent operators will still face VoIP competition.

The licensing of VoIP in Bangladesh was delayed while attempts were made to establish a common platform to route all VoIP calls for national security reasons and to monitor VoIP revenues. Then when the current licenses were issued in 2009, they were set high to minimize the number of competitors.

At that time, it was thought that up to 200 illegal VoIP providers were operating in Bangladesh; mainly connecting international calls from pre-paid card users, using VSAT links. The use of VSAT for voice services is not permitted. VoIP-based call termination business captured over 40 per cent of the market of incoming and outgoing international calls.

Bangladesh now requires all calls including inter-operator VoIP calls to be routed through Interconnection Exchanges or International Gateways. Intra-operator VoIP calls and other domestic data traffic must be routed through National Internet Exchanges.

The regulator, the BTRC, is still catching illegal VoIP operators. In the first eight months of 2011, the Rapid Action Battalion seized Voice over Internet Protocol (VoIP) equipment from eight unauthorised VoIP business centres — seven in the capital and one in the port city of Chittagong. And the BTRC has a running banner on its site saying: 'Urgent Notice on Illegal VOIP: If you receive any overseas call which has a CLI display of any Bangladeshi mobile or PSTN number, please send us that number (contact details provided)'. Changing the calling number from international to local before presenting it for termination on a fixed or mobile service reduces the interconnection payable (and if it terminated as data on, say, a PC no number substitution is necessary and no fee is paid).

◂ Box 5.1: VoIP Licencing and Bangladesh

Sources: **International Long Distance Telecommunications Services Policy**, Bangladesh Ministry of Posts and Telecommunications, May 2010, TeleGeography, 6 Aug 2009 and **VoIP and relevant Issues: Bangladesh's Context**

The ability of mobile broadband users to access Skype using iPhones led certain European operators to block Skype access over their networks to prevent loss of revenues. Regulators are now beginning to stop such practices on the basis that it is inconsistent with **net neutrality** .

VoIP class licences have different rights and obligations attached to each type of licence depending upon how closely the licensed service resembles PSTN voice services. **Barbados** has four different classes of VoIP services.

Singapore also has just two class licences. VoIP providers who want PSTN numbers (starting with '6') must adhere to all PSTN rules VoIP providers can also get 8-digit numbers starting with '3' where PSTN rules do not apply.

Hong Kong also adopted a two-class approach to regulating IP Telephony. Both classes of service provider must provide access to emergency services and to reserve power, but they differ in the requirements they face for number portability and numbering. Class 1 is equivalent to PSTN voice service with number portability, but Class 2 lacks numbering rights.

and **http://www.ofca.gov.hk/mobile/en/consumer_focus/education_corner/guide/advice_lfs/ipts/**

◂ Box 5.2: Singapore and Hong Kong VoIP Licensing

Sources: **Asia-Pacific Economic Cooperation Telecommunications and Information Working Group, Tuesday, 25 April 2006, VoIP in Singapore, presented by Muhd Hanafiah**

In the future voice telephony will migrate completely from circuit switched telephony to VoIP. Once this happens, Internet interconnection and pricing models may replace the current arrangements. Until that happens, VoIP network operators will need to interconnect with incumbent network operators' PSTNs.

VoIP providers require access to the PSTN to terminate calls to recipients who do not subscribe to the VoIP provider's service. Interconnection typically occurs between a VoIP operator's gateway and the PSTN operator's point of interconnect closest to the call originator or recipient. For calls terminating on fixed networks, VoIP operators should pay PSTN operators for call switching and routing in much the same way that other carriers (such as mobile and long distance operators) do. This may be hard to enforce (Box 5.1).

Call originations from fixed networks may require a different pricing and access mechanism. For many VoIP services, the caller originates the call over a broadband access link or a wireless network. Carriers have no visibility of such VoIP calls originated on their access networks; they are just part of data traffic. However, no originating interconnection fee should arise because the customer is paying for the access link and any traffic carried over it.

Wireless networks will have a substantial impact on VoIP service development, particularly in developing countries. As wireless and VoIP traffic increase, differences in the terms and conditions under which wireline, wireless and VoIP operators interconnect networks will create opportunities for **arbitrage** and distort markets. Differences in call termination rates and interconnection arrangements can cause operators to adjust traffic flows to obtain the lowest possible rate, and to minimize regulatory fees.

Practice Notes

- Barbados: Regulation of Voice over Internet Protocol (VoIP)
- Forms of Arbitrage
- Regulatory Implications of VoIP

Reference Documents

- Asia-Pacific Economic Cooperation Telecommunications and Information Working Group, Tuesday, 25 April 2006, TEL 33 - Regulatory Roundtable, "What are APEC Member Economies' laws, policies, and/or regulations on Voice Over Internet Protocol (VoIP)? How many VoIP users are there in each Economy?"
- Bangladesh - VoIP and relevant Issues
- Bangladesh: International Long Distance Telecommunications Services Policy, May 2010
- Barbados Voice over Internet Protocol (VoIP) Policy
- Finland -- Application of Communications Legislation to VOIP Services in Finland
- GSR 2009 Discussion Paper, Voice over Internet Protocol (VoIP): Enemy or Ally
- Hong Kong China - Regulation of Internet Protocol (IP) Telephony
- Malaysia -- Guidelines on Telephony Services over IP
- Singapore -- Guidelines on Licensing and Regulatory Framework for IP Telephony in Singapore

2.5.4 OTHER 'OVER-THE-TOP' SERVICES

There are a number of other OTT services apart from VoIP that have been enabled by IP and which all have significant implications for market developments. They may pose a challenge for existing providers but do not seem to be as challenging for regulators as VoIP.

Apps that enable instant messaging and voice communication via data plans compete directly with the SMS and voice services upon which operators depend for a substantial portion of revenue. The average revenue per delivered byte is dropping, as SMS bytes, are replaced by 'over-the-top' bytes.

◂ **Box 5.3: SMS and AT&T**

Sources: AT&T June 2, 2010 Press release **http://www.att.com/gen/press-room?pid=17991&cdvn=news&newsarticleid=30854&mapcode** and **http://en.wikipedia.org/wiki/Text_messaging#Pricing_concern**

AT&T provides a typical example of how lucrative SMS is for mobile carriers and how they may respond to the threat from OTT messaging apps.

AT&T charges 20 cents per text message if a customer does not have a messaging plan or has exceeded the allotted number of texts. From August 2011 AT&T eliminated the $10-per-month 1,000 messages option and the $5-per-month 200 messages option for individuals. New customers have the choice of either $20 per month for unlimited texting or paying $0.20 for every text and $0.30 for every multimedia message that they send or receive.

Given that an SMS message is at most 160 bytes in size, this cost scales to $1,310 per megabyte sent via text message. A one-minute phone call uses up the same amount of network capacity as 600 text messages, so that if the same cost-per-MB were applied to phone calls, mobile phone calls would cost $120 per minute.

To deal with OTT messaging apps, AT&T replaced its $30 per month unlimited data plan in June 2010 with two options. One offers up to 200MB for $15 per month (with additional use charged at $15 per 200MB). The other offers 2GB for $25 per month (with additional use charged at $10 per 1GB).

But SMS is not dead [*]. The apps that compete with it depend upon both ends of the communication using the same app: they are closed systems. But SMS is on every phone: not just smartphones.

SMS is almost as good as email which runs on every platform and carrier throughout the world. Email is not available on every phone but in some cases it is better than SMS. For example, in Japan SMS is not cross-carrier. So a DoCoMo customer cannot text a Softbank user. But, if the phone has an e-mail client and an email address, it is the best messaging option in Japan; as long as you have a cheap data plan. And, it is more easy for manufacturers to build email clients into phones than anything else, because email has standard protocols behind it.

Cloud Services

Traditionally, users had to physically connect devices to move, say, a photo from a smartphone to a home computer. With cloud services, as soon as a photo is taken it can be uploaded immediately to the cloud to be viewed anywhere, on any device. Google, Microsoft, Apple, and Amazon have all made significant investments in their operating systems and cloud services so that computers and mobile devices will seamlessly and silently upload files to one master location.

Cloud services put more pressure on network capacity. Traditional (physical) syncing placed no demands on the network but the cloud changes things. Now, instead of consuming no bandwidth when syncing 100 MB of photos back to a computer, cloud syncing uses 100 MB of data when uploading data and then an additional 100 MB downloading to each device connected to the cloud. While most services offer the option to sync only when on WiFi networks (e.g. coffee shops, living rooms), these cloud services could still result in significant additional bandwidth costs and potential bill shock for consumers. For subscribers who perform complete system back-up, the shock could be even greater.

There are no clear issues yet for competition and pricing and any that emerge are likely to be addressed first in developed markets.

Internet Television

Digitisation of broadband networks (both fixed and mobile) is causing tectonic shifts in business models. Traditionally, carriage and content went together: not any more. Video was the 'killer app' that prompted the building of cable and broadband networks. The network builders assumed they would be the providers of the content. But the impetus for delivering content over broadband is now coming from non-traditional sources that do not build the networks they rely on.

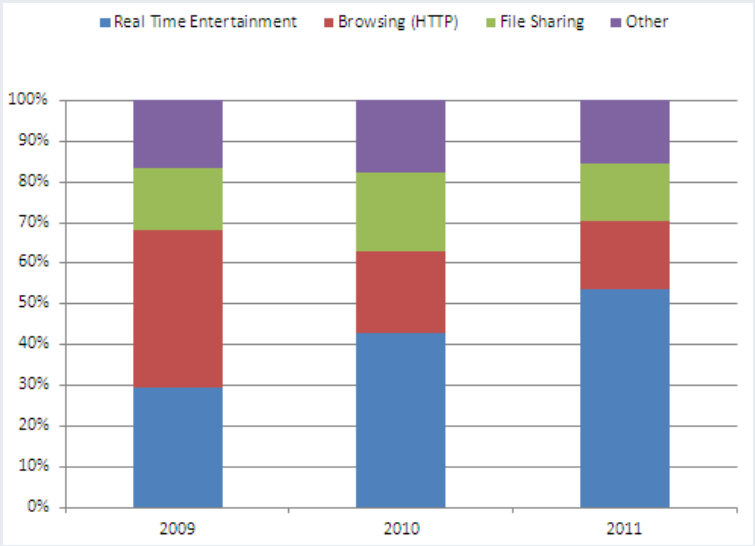
In 2007, Netflix started streaming back-list movies to subscribers in the USA and now has over 20m customers globally. It began offering unlimited movie downloads in Canada for $7.99 a month in 2010 and by August 2011 it had signed up 10 per cent of Canadian broadband households; a feat that took six years in the United States.

Sandvine reports that Netflix accounted for 32.7 per cent of all North American peak fixed access downstream content in the Fall of 2011. That put Netflix ahead of the other three top Internet protocols or services by daily volume—approaching double HTTP (17.48 per cent), almost three times YouTube (11.32), and nearly four times BitTorrent.

◂ **Box 5.4: Netflix**

Source: Sandvine ***Global Internet Phenomena Report***, Fall 2011

Content producers, equipment vendors and communications service providers have a 'three screen' strategy to deliver content to TVs, computers and mobile devices [*]. More than half the peak-period traffic over fixed access networks is real-time entertainment with more than half going to game consoles, smart TVs, handhelds and mobile devices rather than to desktop and laptop computers.



◂ **Figure 5.4: Peak Period Traffic Composition, North America**

Source: Sandvine ***Global Internet Phenomena Report***, Fall 2011

Not only have the builders of networks been deprived of the revenues that they expected out of video but also they have to augment their networks to keep-up with the growth in video traffic; on which they earn very little. Most video traffic adapts to network congestion by shifting to lower bitrates and quality, which impacts the subscriber experience on broadband. When capacity is increased, adaptive video simply upshifts to a higher fidelity and fills the new capacity [*] One of the features of TCP is that each data packet must be acknowledged by the receiver or it will need to be retransmitted to guarantee in sequence delivery of the original data stream. If these acknowledgements are unable to quickly return to the originating server, then the TCP streams

carrying the subscriber's video will slow down. This is seen by the subscriber as a downgrade in their quality of experience..

Regulators do not want to stifle innovation across content and devices. Carriers will have to adapt their business and pricing models.

Reference Documents

- Internet: Sandvine, Global Internet Phenomena Report, Fall 2011

Next: 2.6 Mobile and Wireless Network Regulation ➔